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# MEMOIRS

OF

# N. LAWRENCE AUSTEN

21

Walter Townend.

In Memory of N. L. A.

January. 1948.

# NATURAL HISTORY PAPERS.

*Green be the turf above thee,*
*Friend of my better days;*
*None knew thee but to love thee,*
*Nor named thee but to praise.*

# NATURAL HISTORY PAPERS

AND

# MEMOIR

OF

# N. LAURENCE AUSTEN.

EDITED BY

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INSPECTOR OF SALMON FISHERIES.

In Memoriam.

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MARY, Second daughter of
Nath.l & Frances-Honor Austen
late of Margate Kent;
who died November 1.1820,
Ætat 27.
late of Margate
He died October 15 1804
aged 52 Years.
Also of
FRANCES HONOR AUSTEN
June 9th 1861
in the 98th year of her age
who died July 11th 186
aged 82 years
AND IN THE SAME BLESSED HOPE THOSE
OF HIS BELOVED SON N.L. AUSTEN, F.L.S.
BE GONE 21.1847 D. AUG. 9.1874.

# MEMOIR

OF THE LATE

# NATHANIEL LAWRENCE AUSTEN.

BY THE EDITOR.

THE reader would probably like to know how this memoir of Nathaniel Lawrence Austen had its origin.

About Christmas time, 1876, I proposed to the respected Mother of our late lamented friend that it would be advisable to collect and print an "In Memoriam" volume of the natural-history writings of this talented young gentleman.

Having been Editor of the Natural History and Fishery columns of *Land and Water* from the commencement, in 1866, of that publication, I have selected the following papers from Mr Austen's numerous and able contributions to its columns.

Nathaniel Lawrence Austen was born on the 21st June, 1847, at the Acacias, Croydon. His mother informs me that, as quite a child, he was passionately fond of watching all living things. His parents always encouraged this natural ability, and allowed him, at his own free will (even at that early age, and still in the nursery), to hunt for frogs, toads, mice, birds, &c.

As he grew up he observed and collected all the animals he could find in the garden of the Acacias, Croydon, and when about six years old, and just able to frolic about, he was taken by his parents to Margate, where they gave up to him the balcony of the house for a museum and vivarium.

As the tide went down young Austen followed the receding waves, collecting all the "curios," both living and dead, for his marine observatory in the balcony.

Even if I had not had the pleasure of knowing intimately this very talented young man, the characteristics of his mind must have become apparent from his writings.

He had very great powers of accurate observation of living creatures, their instincts, habits, and structure. He had that peculiarity which but few persons possess, namely, a natural sympathy with what are generally called dumb animals, and this

faculty so strongly developed in him will account for his wonderful power over animals.

He writes: "There seem to be few if any animals which are not susceptible of the influence of man, and cannot be rendered docile by an unvarying course of kind yet firm treatment."

Again we read: "I always endeavour by means of kind treatment to make my animals and birds agree with one another, and have reconciled many of the most opposite classes. As I now write a large wolf-dog is lying close to me, with the large tom-cat ('the marmot's friend') snugly pillowed amongst his thick fur, while a magpie is hopping about close to them, and one of the dormice is nibbling a nut within two inches of the cat's paw."

These habits of sympathy with, and kindness to, creatures inferior to us in the scale of creation enabled him to have great success with the breeding of animals. The article on the "Nesting of the Eagle Owl at Croydon" will show that, in his own words, "to induce birds of this genus to breed in confinement it is always necessary to have the cage or aviary adapted to the habits of the species kept, and on no account must the birds be disturbed in any way during the period of incubation." He was so careful, that he would not allow the gravel to be rolled or the grass cut with the mowing machine, for fear of disturbing them.

He certainly would not have succeeded in breeding these owls if he had not known that they make their nests in an excavation in the earth. Knowing well the habits of the raven, he supplied his birds with the suitable material and conditions for nesting, and in consequence was enabled to record the structure of the nest, and many other interesting points in the habits of these birds, which I regret to say are gradually becoming very scarce in England.

He extended his researches into the breeding of fish. His description of the ten-spined stickleback forming its nest is very accurate. "The situation he (the fish) chose was on an irregularly shaped pebble, which rested against the glass side of the tank, enabling me to watch its movements closely. He took great pains in his building, and interlaced the various portions of the structure with great care.

"The young fish made their appearance in twelve days, and were comparatively sluggish for the first part of the time, remaining either upon or in the immediate vicinity of the nest."

A point to be noted in Mr. Austen's character was his kind consideration for the lives and welfare of the birds, beasts, and fishes which came under his observation, whether in the wild state or in his room as pets. Thus, when he discovered the nest

of the "eagle owl" in Norway, he writes: "I watched the family group for some time; I left them without disturbing them or injuring them in any way." I fear that there are few sportsmen that would have allowed these poor birds to live, as did our humane friend, Austen.

Then, again, how considerate he is towards his pets, taking every possible care of them until the time when his great knowledge of their habits informed him that if he continued his attentions to them any further, they would probably not survive such attentions, even though they were well meant for their comfort and happiness.

He writes, p. 40, "My young bat throve wonderfully well, and lived with me more than four months, when *I gave him his liberty* with the others, as I was afraid they might not bear the cold of the winter so well in confinement as if permitted to chose their own places for hybernation."

Mr. Austen was a true sportsman in every sense of the word. Three times he took shooting expeditions to Norway. The first was in 1869; the result of these trips was the admirable and accurate descriptions of the "Reindeer in his native home."

These expeditions required much power of endurance and pluck. Mrs. Austen informs me that her son once had a narrow escape; he slipped down the side of a precipice, his rifle being slung on his

back; beyond somewhat severe bruises in the back, he escaped injury.

Mr. Mattieu Williams writes:—

"I should not recommend anybody to attempt deer-stalking *alone*; for a sprained ankle, a broken leg, or even a slighter accident or ailment, might, when thus beyond the reach of help, be fatal.

"Pluck, patience, self-control, endurance of hardship, and the general qualities of true manhood are demanded of the wild reindeer hunter.

"Two or three weeks he may have to spend in the chase, with the game more or less in view all the time, before the opportunity of a shot is obtained. The huntsman living all the while on the wild moorland field, and more or less upon the snow, feeding upon what he carries with him, *plus* occasional (but rare) windfalls of *fladbröd* and draughts of milk at solitary *saeters*. He sleeps on the rocks, or within some lone rude hut, always keeping hidden and to the leeward of the game; as the scent of a man to windward is detected by the deer long before he comes within gunshot.

"I was told of cases where deer were thus followed for days, while at last, when the sportsman had crept within a few yards of their range, he was seen, or scented; the deer bounding away, and being altogether lost.

"The first Norsk phrase that every tourist should learn and use is '*Vaer saa god*' ('Be so good'). It is a common compli mentary expression, and used as a prefix to every request, and acts like a talisman in securing prompt and cheerful attention."

Austen was also endowed with a great power of word-painting; here, for instance, is a pretty passage describing an exciting stalk after reindeer. "Down we crept as cautiously as possible, taking

care to place our feet so as not to allow pebbles to roll down, and above all to prevent the rifle-barrels clinking against the stones. After about half-an-hour's caterpillar-like progress, great part of which was in the bed of an icy-cold mountain stream, we reached the masses of disrupted rock, and at length found ourselves within 150 yards of the deer. For the first time I had the opportunity of a good look at these splendid animals in their wild state." His ideas of a herd of elephants based upon his knowledge of their structure and their habits (see p. 107) is also written in his best style.

Concerning shrews he writes, "A small colony frequently inhabit the same spot, and towards the cool of the evening may be observed searching for food, and sporting with each other in the water, now hiding behind stones or large leaves to elude their companions, and then darting out to engage in a general skirmishing chase, diving and swimming with the greatest activity, and occasionally taking a plunge into their holes."

There are many other prettily-written passages in his writings which the reader will doubtless duly appreciate.

Mr. Austen was a true disciple of Paley, who wrote that admirable book on *Natural Theology*. Austen, like Paley, saw Beauty, Design, and Order in all God's works, as exemplified by the Creation.

His description of the foot of the reindeer as admirably adapted to traverse the snow-covered Norwegian mountains is well described at page 16, and his explanation of the use of the reindeer's horn at page 18 will be new to many. Formerly it was supposed that the palmated brow antlers of this animal were used to shovel away the snow that concealed the moss which formed the animal's food. Mr. Austen's explanation of the real purpose to which the antlers are applied is excessively interesting.

The portrait of the Aye-aye and its curiously-formed paw or hand at page 151 will be examined, after reading Mr. Austen's account, with interest, inasmuch as he describes the use of the peculiar long finger, which before a living specimen was observed in captivity was a considerable puzzle to naturalists. Notice also the explanation of the use of the cheek-pouches of the Hamster described at page 163.

As regards colours our author has several good passages to show how the colours of animals are not the work of chance, but of design. He instances at p. 50 the vivid green of the tree-snakes, the sand tint of the poisonous cerastes, the colour of the lion, and the stripes on the tiger's coat.

The subject of birds' nests also affords him an additional argument; and he instances the nest of

the golden-crested wren as closely simulating the colour of the bark of the branch on which it is built, p. 121.

The clothing of animals was carefully noticed by him; his remarks at p. 57 on the hairy tiger, the fur of the bat, the water-vole, and especially the ear of the water-shrew, showed that already he was collecting evidences of design.

In many passages we may discern that our author had already worked out for himself an outline of the wonderful manner in which animal life is regulated by the law of "eat and be eaten." When writing of the oyster, p. 117, we find this idea well expressed, thus, "I think it will be found in all animals that multiply their species at a very great rate, of which every individual brings forth its thousands, that on the opposite side of the balance-sheet there are a great number of enemies ever present to keep under the species and prevent its increasing in undue ratio." He applies this observation to real practice in his instructions as to how to manage a reptile vivarium. He describes a failure from want of knowledge of the habits of each animal in the following words:—"A pretty scene of confusion took place; fish were killed or had their flesh eaten away by voracious beetles; newts escaped and were trodden upon, or were found in unexpected places to the terror of weak-nerved persons."

Ever since I myself began the study of natural history I have always endeavoured to impress the necessity of turning it to account for the benefit of mankind. I first coined the term "Practical Natural History," an idea which was at first much derided, but which has now become fully recognised, in which I was greatly supported by my friend Mr. Henry Lee, of The Waldrons, Croydon. Mr. Austen's mind was of a most practical turn; his observations of the habits of toads and frogs enabled him to advise in a matter which at first sight does not appear to be of very great importance. I refer to his advice on the question of sending toads to New Zealand (where they are greatly needed), as now recorded at p. 129, for the information of those colonists who wish to benefit New Zealand by the introduction of an apparently useless, and I fear much despised, reptile.

His discovery that water-shrews are fish-eaters has proved of great use to the, I am glad to say, numerous breeders of salmon and trout by artificial means. Precautions to prevent water-shrews killing the fry are now taken, since the time that Mr. Austen's remarks were published.

When instituting experiments on the breeding of oysters at Reculvers, near Herne Bay, with Mr. Henry Lee, our mutual friend Austen frequently came down to assist at and watch our proceedings.

The result of these visits was a paper on the oyster, p. 111. The facts mentioned I thoroughly endorse, and I regret much that the paper remains unfinished by the author.[1]

After reading Mr. Austen's papers in this little book, naturalists—whether young or old—will see that a large field of observation yet remains to be worked. Our author's monograph on the "British Bats," the able paper on "Shrew-mice," tell us much that is new relative to the structure and habits of these creatures, which are so rarely observed. The paper on Hedgehogs (p. 139) entirely dissipates the idea that they will suck cows; and after reading his humane advice relative to keeping rabbits and rodents without water (pp. 144 and 147) much misery will be spared to these unfortunate little animals, who will for the future, I trust, owe a regular water-supply to the remarks of Mr. Austen.

I have not placed Mr. Austen's papers in a definite order. I have printed them in such a manner that hardly a page can be opened without the reader finding some pleasant and useful information.

[1] I am happy to be able to state that an Act of Parliament was passed in the session of 1877 for regulating oyster culture. The chief and most important provision of this act is a close time for native oysters from the 14th May to the 4th August.

I have given a photograph of our author from a negative taken by Mr. Rylands, of Cambridge. It is a capital portrait. In stature Mr. Austen was broad-shouldered, and built like a little Hercules. His eyes were peculiarly brilliant, quick, and very observant. He had a splendid memory, and was an excellent linguist; the quick way he picked up the Norwegian language when reindeer-shooting in Norway amply proved this. Although retiring and unobtrusive in his habits, he was very courageous and quick at expedients. He was a proficient in all manly exercises, and was a great adept at the sword-exercise and fencing. In fact he was an excellent swordsman, being able to perform many feats with ease that required skill and strength. I was always glad to see him when he called at my house in Albany Street; and Mr. Searle, my secretary, informs me that when I was out and could not be with him, or when tired of examining my specimens and books, he was very fond of taking down the sword and displaying his skill in sword-exercise.

Mr. Austen was educated at Aldenham, near St. Alban's. In 1868 he went to Peterhouse College, Cambridge, and when studying there made the acquaintance of his friend Mr. Laidlay. Mr. Laidlay has been kind enough

to write the following reminiscences of his friend :—

"I first became acquainted with my much-lamented friend Austen upon the occasion of his entering St. Peter's College, Cambridge, as a fellow-commoner, at the beginning of the Michaelmas Term, 1868, and from that date until his sad and untimely death our friendship continued uninterrupted. Although some nine years—years, alas ! but too full of change—have slipped away since our first meeting, still I have a most vivid and distinct remembrance of it, and of the conversation, so characteristic of my poor friend, which took place soon afterwards. We were introduced to each other in the Combination Room of the College, and then almost at once went into the Dining Hall. During dinner it so happened that Austen and myself sat side by side, and before long the conversation turned upon wild sports, the fiercer forest animals, and natural history in general. I need hardly say Austen introduced these subjects, and much surprised me at least with the keen interest and knowledge which he displayed in connection with them. That conversation proved a true index and guide to the character and tastes of its originator, and was the forerunner of many like itself. These conversations were always extremely interesting to me, and

particularly so when my poor friend spoke of his personal experiences or observations, for I knew him to be at once a keen and truthful observer of nature. In the ordinary course of events Austen and myself must ere long have got to know each other fairly well from the circumstance of our dining daily together; but our opportunities for meeting and friendly intercourse were greatly increased by the fact that Austen's rooms were on my staircase, and indeed next door to mine. Thus for three and a half years I lived within a few yards of one who had many friends; and it is in virtue of the opportunities which were afforded me of knowing him, rather than because I profess to have been intimate with him above all his other Cambridge friends, that I venture to write this brief sketch of his college life.

"At college, as elsewhere, life has its needful drudgery, its routine, its pleasures and disappointments, nay, even its monotony, and Austen's lot differed but little from the ordinary lot in this respect—that his university life, like that of most, had its sunshine and its shade. But I need not attempt to follow my poor friend through all the minute details and experiences of his sojourn at Cambridge. It will be sufficient for the purposes of this introductory notice, if I deal briefly with the manner and nature of his studies and amuse-

ments—for study and amusement, as all know, form the two grand divisions of university time. As regards his studies, I may say that in a sense Austen was always studying, for the commonest weed or the humblest insect was to him a study and a joy. Nature was the book he loved to read, and right diligently did he devote himself to the perusal of her exhaustless pages. With such a passion and absorbing love for the study of natural science, can it be wondered that the study of the ordinary, but none the less necessary, subjects prescribed as preliminary to every degree, should have proved somewhat irksome and distasteful to him. The study of nature was a pleasure, nay, more almost a necessity; the acquisition of Greek, Latin, and mathematics a labour and a toil. And so it was that many and many an hour which some of us believed, or at least hoped, was being spent in getting up necessary routine work, was after all devoted to the study that he loved, and in which he so much excelled. To this tendency to postpone such distasteful tasks a temptation was never wanting—for my poor friend's rooms overlooked the college grove and gardens, a situation for observing nature such as but few college rooms afford. In the grove was confined a small herd of deer; need I say that they were objects of interest to Austen, whose liberality, if not his voice, was well known to

all of them, as they lingered beneath his window in patient expectation? And then the garden, with its plants, its moths, its nightingales, and the old elms in which the large fen bats had their homes; had they not also their charm and grave interest to him that is gone? Indeed they had; and even now, after a lapse of years, I might tell much of his doings in that grove and garden, for even as I write I seem to see him walking there.

"But while writing of the delight and enthusiasm with which my poor friend prosecuted his favourite study, I should be much to blame if I made no mention of his skill in pen-and-ink drawing. This gift, for such it really was, gave great pleasure to his numerous friends, who in the evenings literally flocked to his rooms, such was his popularity; and many and many a time have I seen him dash off an effective sketch to clinch some argument or satisfy some importunate and inquisitive guest. In my opinion these drawings—of which I fear but few now exist—more than anything Austen said or did or wrote, unmistakably and convincingly prove that he was a born naturalist.

"Their subjects were invariably animals, drawn entirely from memory with great rapidity; and I may add great continuity and precision of outline. The only materials he used were ink and paper; his only instrument a quill. But with such

simple appliances the greater skill is required, as in most cases a faulty outline cannot be corrected. Yet Austen's pen rarely wavered, and so strongly was imprinted on his mind the image which he wished to portray, that with a few sweeps and dashes of his pen he produced a spirited representation of some monarch of the desert or humbler animal, as occasion might demand. Nor did Austen confine himself to drawing particular animals for ever in one stereotyped attitude, as is the habit of those in whose mind there dwells not the image of the animal itself, but merely the recollection of some picture or drawing which they have seen of that animal; but, on the contrary, he was able and ready to draw in any position that might be suggested or required.

"There was also implanted in poor Austen's nature, almost as strongly as was his passion for natural science, a love of sport; and this leads me to say a few words about his amusements generally. Though I feel I have in some measure dealt with these already, in speaking of that pursuit which was at once his favourite study and chief delight. I cannot say that Austen took much interest, or at any rate any very active part, in the ordinary amusements of university life, such as boating, cricket, &c. He devoted more attention, however, to gymnastics, fencing, boxing, and sword

exercise; but although he excelled in all of these last-named exercises, I think he always looked upon them as makeshift amusements, only worthy of being taken up when nothing better could be had. The love of sport, the love of the dusky hills, and the wild sounds of the uninhabited places of the earth, have their charms for most of us; but for him of whom I write they had an almost irresistible attraction. Shooting of any and every kind, fishing when and where it could be had, and the almost equal pleasure of preparing for these pursuits, occupied no inconsiderable portion of his thoughts and time, and, therefore, I think that these must be held to have been, even while he was at college, his chief amusements. He was not only fond of sport, but more than that, was a keen and thorough sportsman, prepared to endure much and make considerable sacrifices to gratify this instinct. My poor friend's expeditions to Norway in quest of reindeer are far more convincing proof of that than any mere statement of mine can be. Those expeditions to Norway, which bear such powerful testimony to his enthusiasm for sport, are spoken of in another portion of this introductory notice, so I need say no more about them, than that I fully endorse the opinion there expressed as to the pluck and courage of him who feared not to walk the gloomy hills alone.

But, alas! how sad is it now to recall the preparations he made for these expeditions to Norway, his pleasure in speaking of what he had there seen and done, his hopes of being able to go back again some day, and then to awaken to the sad reality that he is gone from us,—gone never to return. I might write much of his love for sport, I might tell how I have seen him with nervous and anxious care stalk some seal or heron; but although it is needless to detail such incidents in order to convince any one who knew my poor friend—and this introduction is only addressed to such—that he was an enthusiastic sportsman, still, I cannot refrain from describing one evening's shooting we enjoyed together; an evening which I know made a lasting impression on him as on myself.

"We had been out all day fruitlessly trying to get near some wild ducks, and as we returned I suggested that we should go to the ruins of Tantallon Castle, and try the wild rock pigeons by moonlight, so accordingly we did. The night was calm, and the moon, having waded through the few frosty clouds which hung on the horizon, cast a flood of light, making night almost as bright as day. We took up our position in the shadow cast by the great central tower, and far beneath us stretched the restless sea, weaving its silvery web in the moonbeams. There was no wind, scarce a

breath stirred the mighty ocean, only the recollection of some past gale moved its troubled breast; and the hollow cliffs echoed and exaggerated the sullen mutterings of its waves as they dashed upon the sea-worn rocks beneath. The scene, the sounds, and associations, were impressive, but for a time at any rate they were forgotten, as the pigeons, disturbed by our entrance, whirled round the ruin, occasionally trying to settle above us upon the central tower. Fortune smiled upon us, and Austen was perfectly delighted; indeed, I never heard him express himself so strongly with reference to any sport as he did that evening as we walked home in the calm clear moonlight in happy ignorance of the future. Next night we returned to the ruin, but it was amid rain and wind—such are the vicissitudes of life.

"And now I have dealt briefly with the studies and amusements which were dearest to my friend; but I cannot close this brief notice without alluding to that kindliness and hospitality, which were among his chief characteristics.

"He was indeed 'given to hospitality,' a hospitality which was not only for his own companions, but extended gracefully to their relatives, and even to their chance visitors. When he learned that any such were sojourning—for however short a time—in Cambridge, he was ever anxious to be

allowed to help his friends in doing the honours of the College, and thus many a choice little entertainment, improvised with good taste and well-timed fitness, doubly gratified his friends and the guests who were at once theirs and his. But besides, and better far than this view of genial kindness, he possessed that sincere and constant amiability which not only conduces to the formation of friendships, but is a perfect guarantee for their continuance when made. But I need say no more about the talents, tastes, and virtues of him that is gone, for his writings, to which this introduction is prefixed, suggest and indicate, if they do not fully disclose, his talents, while his kindliness, generosity, and goodness of heart were self-evident and dear to all who knew him, and for such alone I believe this work to be intended. He is gone. Death has robbed his friends, and myself in particular, of a kind, amiable companion, a true and faithful friend; and now there remains to us nothing but his cherished memory! and truly thankful am I not only that I have none but the most pleasing recollections of him, but also that they form an imperishable possession, of which nothing, no, not even time itself, can deprive me."

Among our intimate and mutual acquaintances was Mr. A. D. Bartlett, Resident Superintendent

at the Zoological Gardens, Regent's Park. Having read the proof sheets of this volume, Mr. Bartlett expressed to me his opinion that it is the work of a talented, painstaking young naturalist.

Mr. Austen was accustomed to make frequent and long visits to the various animals under Mr. Bartlett's charge in the Regent's Park Gardens. So anxious was he to learn all he could, that Mr. Bartlett, finding that the young man really wished to study, frequently allowed him to accompany him round the gardens when he made his official inspections, in order to assist him in carrying on his various researches.

In return, Mr. Bartlett acknowledges that he is indebted to Austen for valuable hints as to how to keep alive and in good health water voles, shrews, and common moles. He desires me to add, as a comment to Austen's remarks on hairy tigers at page 55, that there is now in the gardens a tiger from Amoy, in China, which has a long, woolly coat, and in the same den with this animal is also a Malay tiger, which has a short coat. The great difference in the hair of the two tigers confirms Mr. Austen's remarks as to the effect climate produces on the coats of tigers.

On page 66, Mr. Austen mentions the quiet disposition of the cheetah. There are, however, exceptions to this.

A cheetah belonging to H. R. H. the Prince of Wales, now in the gardens, is a disagreeable savage animal, no amount of kind treatment will tame him ; there is also in the collection another cheetah from South Africa, called the woolly cheetah, this also has an untamably bad temper.

When writing of the African elephant at the gardens (see page 106), Mr. Austen remarks : " He is at present, Feb. 24, 1866, between five and six years old, and will probably prove a very large animal, being now five feet one inch in height." The elephant is now no less than ten feet five inches in height, so that he has grown five feet four inches in eleven years. This is the most rapid growth of an elephant on record. Sir Joseph Fayrer tells Mr. Bartlett that no Indian elephant ever grew at this unprecedented rate. This beast has grown twice as much as an Indian elephant in the same time. So that Mr. Austen's prophecy, that this African elephant would grow to a large size, has been fulfilled. This rapid growth is due to the great care Mr. Bartlett takes that the skin of the elephant shall be kept clean and soft. Mr. Bartlett recollects quite well Austen's trying experiments on tigers with valerian, as recorded at page 60. He thinks Austen's discovery very important, as it may enable hunters in India to attract and kill man-eating tigers. These are generally

mangy, worn-out old brutes, who find it much easier to kill a human being than to catch a deer or stag.

Austen's success in breeding the eagle owl Mr. Bartlett thinks highly commendable.

Mr. Bartlett has been lately travelling in Norway; he never saw anything more than the foot-tracks of the reindeer in the snow regions. He was never as fortunate as Austen to see the living animal on its native mountains.

Mr. Bartlett found the same moss as eaten by the wild Norwegian reindeer growing abundantly in the deer forests of His Grace the Duke of Sutherland; he therefore considers there would be no difficulty in acclimatizing reindeer in Sutherlandshire, should his Grace wish to introduce a new game animal into these northern highlands. Mr. Bartlett has now in his possession a foot of one of the reindeer killed by Mr. Austen. It is handsomely mounted as a pincushion. He considers that Austen's chapter on the reindeer of Norway, p. 12, contains probably the best observations ever published on this interesting animal, as in his remarks he has combined the courage of the sportsman with the science of the naturalist. The sketch of the reindeer facing page 31 is highly characteristic of the living animal. He has several sketches of animals done by Austen. He was often

surprised at the quickness and fidelity with which he dashed off these life-like portraits of living creatures.

At Stavanger and Bergen, Mr. Bartlett met some gentlemen and guides who had been Austen's companions when stalking reindeer, as recorded at page 12. From their remarks he learned that Austen was a great favourite, and that his untimely loss would be greatly felt by the hunters and guides among the mountains of far-distant Norway.

It was first through my friend Mr. Henry Lee of The Waldrons, Croydon, that I made Mr. Austen's acquaintance. Mr. Lee has been good enough to add the following obituary memoir of our mutual friend :—

On the 10th day of August, 1874, this intellectual, clever, and amiable young naturalist was taken from his sorrowing mother and numerous friends by the hands of an all-wise Providence.

The cause of his much-regretted death was a fall from his horse.

The funeral took place at Canterbury on Saturday, 15th August, 1874. He was followed to the grave by some of his most intimate friends.

A photograph is given of the tomb erected to his memory.

Thus has passed away from amongst us a

young man of the greatest ability and promise, both as a member of society and as a student of the works of the Creator.

This little book is printed at the wish of his bereaved and broken-hearted mother, in order that his loving memory may long be cherished by his numerous friends and acquaintances, and especially by those connected with his much-loved home and native town, Croydon. *Requiescat in pace.*

FRANK BUCKLAND.

*December* 17*th*, 1877.

# THE AUSTEN FAMILY.

THE family of Austen (or Austyne, as written in the earlier records) was long resident at Birchington, a chapelry dependent on the parish church of Monkton, in the isle of Thanet, and county of Kent. At all periods wills and other documents attest their possession of landed estates in their native county at Northwood, near St. Lawrence; Bromfield, near Reculver; with lands at Monkton, Minster, Birchington, and elsewhere; and many of the tombs (not brasses) may be seen under the matting at Birchington church.

From 1539, the earliest period to which parish registers extend, being the year subsequent to that (1538) in which the total suppression of the monasteries and religious houses took place in England (the twenty-ninth year of the reign of Henry VIII.), a long and continuous succession of John and Henry Austens for more than a century dwelt near Minster.

About 1670, a son of the race, Stephen Austen, was killed by a blow from one of the sweeps of Minster windmill, having incautiously approached too near after dismounting, leading his horse on the downs with its bridle over his arm, while making memoranda in his pocket-book. His son, born the year of his father's death, is described in a family deed as "of the precincts of the Palace of Canterbury, gentleman," 1695.

Subsequently the direct line was represented by a John Austen, who migrated from Birchington to Canterbury, having inherited landed property near that city, and settled his family at St. Martin's Hill, lying without the walls, close to that first Christian church established in the south of England so well known by the Dean of Westminster's eloquent description; and founded, according to Bede, by Roman Christians A.D. 182. John Austen married, in 1703, Rebecca, one of the co-heiresses of Thomas and Elizabeth Jenkin, of Canterbury, whose pedigree, duly certified on the 20th August, 1663, by Sir Thomas Bish; Clarencieux king-at-arms "by virtue of His Majesty King Charles the Second's commission for examining the armorial bearings of the gentry of Kent"—is still among the family papers.

His wife Rebecca died in 1744, and was buried in the church of St. Martin, as were also nine of

her children; and John Austen (surviving his wife only four months) is buried in the churchyard (close to the walls of the church), in a spot that has since become the burial-place of the family, a monument being erected to his memory on the south wall of the church, bearing the following inscription—

"In Memory of JOHN AUSTEN, late of this parish, who was confessedly great and good in every relation of life. He ordered his body to be deposited in the common burial-place of the dead, but near the remains of Rebecca, his beloved wife, who lies interred, as do also nine of their children, within this church."

John, son of the foregoing John Austen, was born at St. Martin's in the year 1708, and married in 1736 Mary Hulse, born in 1711. She was the daughter of Nathaniel and Anne Hulse; the heiress and last direct descendant of the ancient family of Hulse, or De la Hulse, of Bethersden, county of Kent, whose descent and pedigree (amongst the family documents) is lineally and clearly deduced from the reign of King Henry I., A.D. 1100, and took its rise in that "cradle of gentilesse the County Palatine of Chester," from whence its knightly representatives followed their sovereigns in their Welsh and French wars; while one of the sons held the more peaceful office of "Lord Chief Justice."

As to the further descent of the Austens from

the Hulse family, Sir Hugh Hulse was engaged in the wars in Normandy under King Henry II., and also with him in the army in Wales, when the Welsh had a great overthrow there. He was then knighted by the King in the fourth year of his reign, A.D. 1157.

John Austen, of Birchington, married one of his lineal descendants and the heiress-at-law of the Hulse family in 1590.

John Austen died 1770, leaving ten children, Mary, his wife, following him in 1781, and a monument to their memory is affixed to the south wall of the church.

"In Memory of JOHN AUSTEN, son of John Austen, nearly deposited, who by a conscientious and tender discharge of all the social duties, as a benevolent friend to all mankind, an affectionate parent, and kind husband, was highly esteemed, and died greatly regretted on the 11th January, 1770. Also of MARY, wife of the above John Austen, and sister to Anne Hulse interred within the Church. She died 7th December, 1781, aged 70 years."

Rebecca, their eldest daughter, married the Reverend Thomas Gurney, Vicar of Sea Salter, near Whitstable, Kent, who died 26th June, 1773, and lies buried at St. Martin's; and subsequently William Hougham, the elder, of Barton, and Pheasant Hall, near Canterbury, who, dying 30th

December, 1802, aged 80 years, has a monument to his memory in the church of St. Martin's.

John, the eldest son, resided at the Old Park, and was an extremely popular and agreeable man, of whom honourable mention is made in Halstead's *History of Kent* (folio edition).

Nathaniel, the youngest son, named after his maternal grandfather, Nathaniel Hulse, was born at St. Martin's 1754, and became a highly-esteemed solicitor, first in London, and on his marriage to Frances Honor Lawrence he removed to Union Crescent, Margate, where he died, scarcely fifty years of age, in October, 1804. His wife survived his loss scarcely seven months, dying in May, 1805.

## MAJOR AUSTEN, OF CROYDON.

Their eldest son (the Father of the subject of this memoir), then very young, was offered a cadetship by one of his maternal uncles, and ere completing his fifteenth year, sailed for India in September, 1807, where he was posted to the 10th regiment Madras Native Infantry. Being severely wounded at the assault of a Mahratta hill fort, he returned home

on sick-leave in 1812, having been promoted to a lieutenancy, but returned to his duty by the ship "Cornwall," and landed at Fort St. George, in July, 1814.

From this date until 1826 he was almost constantly in the field; formed one in the "thin red line" that withstood the whole force of Holkar's Mahratta cavalry, and, advancing, captured his guns at Mahidpoor; and was present in most of the engagements which resulted in the British dominion in the East being doubled in extent within that eventful period.

He was twice severely wounded. In 1826, on his return with the remnant of the expeditionary troops from the first Burmese war, he was (by Lieut.-Gen. Sir Thomas Munro, G.C.B., Governor of the Presidency of Madras) appointed to the general staff of the army, "for his approved conduct in those campaigns;" and on his leaving India in 1833, the Government of Fort St. George, after officially expressing their entire approbation of his services, recommended him to the notice of the Home Government, in consequence of his successful termination of a duty of a civil and financial nature with which he had been intrusted by that government. His commissions are dated:—Ensign 3rd July, 1807; lieutenant, 4th August, 1810; adjutant, 18th August, 1818; Persian interpreter and pay-

master, 18th August, 1819; captain in the army, 4th September, 1822; captain of company, 1st May, 1824; secretary to board of general officers superintending army equipments, 3rd February, 1826; and major, 28th November, 1854. In 1851 he received the war medal and clasp for Ava by command of Her present most gracious Majesty; and was appointed to the Commission of the Peace for Surrey, in which county he resided after his marriage to his cousin Marianne Eliza, only child of John Lawrence, who now mourns his irreparable loss, in November, 1867.

His remains rest at St. Martin's, Canterbury, with his kindred, and a monument has been placed within the church.

"In fond and and faithful remembrance of Major N. Laurence Austen, of Haffenden and Combourne, in this County; J.P. for the County of Surrey. Born Nov. 17, 1791; died Nov. 30, 1867.

"He served through the Southern Mahratta campaigns, in Ava, and on the staff of Sir Thomas Munro, G.C.B. By birth a man of Kent, he was the lineal representative of Hulse, of Bethersden, Austen of Saint Martin's, and Sir Wm. Clark, who fell at Cropredy Bridge in 1644, leading the Kentish Yeomen in defence of the King. He leaves one son to honour his memory and emulate his virtues.

"The reason firm, the temperate will,
Endurance, foresight, strength, and skill.
Pure, blessed spirit, nobly planned
To cheer, to counsel, and command."

Over the vault is inscribed, beneath the cross—

"In the hope of a blessed resurrection, here rest the loved remains of Major N. LAURENCE AUSTEN."

"How sleep the brave, who sink to rest,
By all their country's wishes blest!
When spring, with dewy fingers cold,
Returns to deck their hallowed mould,
She there shall dress a sweeter sod
Than Fancy's feet have ever trod."

"The wings of man's life are plumed with the feathers of death," now under the sceptre of Victoria, as under that of Elizabeth: and the dear Son, whose advent brought joy in the present, with hope in the future, has followed his Father to the silent land, leaving the home he made so bright, lonely and desolate.

From the earliest years, that dear Son's love for all God's creatures, his desire to see them happy, was intense; his whole being seemed pervaded with the thought so exquisitely expressed by the Vicar of Christ Church, Hampstead, in his lecture on Milton's *Paradise Lost*, where he says:—

"In the scenery of Paradise, the birth-place of our race, the joy is as the reflection of our Creator's smile.

"We breathe everywhere the sense of the divine satisfaction when 'God saw everything that He had made, and behold, it was very good.'

"The intense felicity of creature existence is so

evidently the will of the Creator, that although in these visions of 'Paradise lost' we are looking, not on the 'things which are seen,' but on those which are 'unseen' . . . for this happy garden is no more on earth . . . and the tree of life now blooms only by the celestial fount of life . . . we know, and are sure that those signs of omnipotent love shall be at length accomplished in the 'new heavens and earth wherein dwelleth righteousness;' for, while the 'things seen' with all their clouds and conflicts, are transient and temporal, the ideals of 'things unseen,' in all their purity and peace, are imperishable and eternal."

M. E. Austen.

# NATURAL HISTORY PAPERS.

# NESTING OF THE EAGLE OWL AT CROYDON.

At a meeting of the Croydon Microscopical Club, held on the 17th April, 1872 (Mr. Henry Lee, F.L.S., F.Z.S., President, in the chair), a paper was read by Mr. N. L. Austen, F.L.S., on the nesting of the eagle owl at Croydon. Although it is not unusual for owls of this species to lay eggs in confinement, it seldom happens that the young are successfully reared. Mr. Austen has succeeded so well in bringing up the young in his own aviary at Croydon that his remarks on their treatment, behaviour, and growth, as detailed in the following report, will be read, we feel sure, by all naturalists with interest:—

A male and female eagle owl in my possession paired in January, 1870. In the course of the previous autumn, in expectation of such an event,

I had had peat earth, about 18 inches deep, laid down in the inner portion of a large wirework aviary, in which they were confined, as it is the habit of this species to nest on the ground. During the last week in January they scratched a large hollow in the further portion of the aviary. Both male and female assisted each other in excavating this, and the first egg was laid on Feb. 11. The hen-bird then commenced sitting, and, as she very rarely left the nest, it was difficult to ascertain the exact period on which the other two eggs were deposited. I am certain, however, that several days elapsed between the laying of the first and the last. Incubation is entirely carried on by the female owl, the male remaining on guard outside, and carrying in food whenever his mate appears to require it. Both birds at this time became very bold and savage. The male, though commonly extremely tame, dashed furiously against the wirework whenever approached, and now showed a particular dislike to dogs, though on ordinary occasions he seemed to regard their presence with indifference. The first nestling was noticed on March 22, and another during the ensuing week, one egg proving addled. They were entirely covered with yellowish-white down, and about the size of newly-hatched goslings. They rapidly, however, increased in size, and when about

three weeks old became covered with brownish-grey down, through which the primary feathers of the wings were just beginning to appear. The old birds were very attentive in supplying them with food, and I noticed that, while the male bird usually carried in rats and birds to them, the female invariably tore the prey up, and distributed it to the young. The feathers now began gradually to appear, and the young owls increased rapidly in size and strength, stretching out and flapping their wings constantly, also making attempts to tear up food for themselves. They were abundantly supplied with rats, their favourite food, and the family usually consumed seven or eight in the course of the day. When two months old the young owls had, with the exception of the head, which remained downy, obtained the whole of their plumage, being able to fly up to their perches, and were nearly as large as their parents. During the next three weeks the down on the head was replaced by feathers, and the peculiar tufts, so noticeable in this species, appeared. The old birds commenced moulting about the time the young were hatched, and had regained their fresh plumage as soon as the young were full feathered. They lived together during the summer and autumn, remaining on perfectly good terms till the commencement of winter, when the old pair began to drive their young

about, and I was then obliged to remove them to another aviary. The nestlings proved to be male and female, but unluckily the female choked herself in November, 1870, with a rabbit-bone while feeding. She measured sixty-five inches in extent of wing, and weighed seven pounds and a half. The male, I am glad to state, is now in perfect health and plumage. The old pair went to nest very early in the spring of 1872, laying their first egg on the 20th of January. The second egg was laid on the 24th, and the third was dropped in the outer compartment of the aviary on the morning of the 27th. This last, unfortunately, was slightly cracked and useless. The other eggs also proved to be addled, but the female continued to sit on them until the 12th of the present month, when she broke them, apparently convinced that they were worthless. To induce birds of this genus to breed in confinement, it is always necessary to have the cage or aviary adapted to the habits of the species kept, and on no account must the birds be disturbed in any way during the period of incubation. The aviary in which my eagle owls are confined consists of a large outer space, covered with wirework, containing some tree-stumps and branches as perches, with a small wooden building attached, closely roofed in, furnished with a door that can be shut in two parts, so that when the lower half is fastened the hen

bird, while nesting on the ground, is not liable to be disturbed by any one passing near the cage.

I have also a pair of the little owl (*Athene noctua*) sitting at present on three eggs, which are deposited in a small covered box, placed in the corner of the aviary. This species in its wild state deposits its eggs in holes of deserted buildings, in crevices of rocks, or in the hollows of decayed trees. I am exceedingly interested in the nesting habits of this species, as, to the best of my belief, it has never reared its young in confinement. A pair in the possession of Mr. J. H. Gurney laid four eggs in May, 1851, of which two hatched out; but as the young soon disappeared, the old birds were supposed to have devoured them. The period of incubation was not ascertained in this instance. No species of European owl, with one exception to which I shall presently refer, as I am aware, forms any actual nest, the eggs being either placed in hollows scratched in the ground, as is the case with the eagle owl, snowy owl, and short-eared owl, or deposited in a tree cavity, or hole in a wall or old building. The tawny owl, barn owl, hawk owl, Tengmalm's owl, lesser European sparrow owl, and scops-eared owl, select such situations for their breeding-places. No materials to form a nest seem to be collected—a want which is in a great degree obviated by the pellets containing the

rejected fur, feathers, and bones of their prey, which are cast up by the parent bird, and, accumulating by degrees, form a soft bed for the eggs or young. The long-eared owl commonly deposits its eggs in the deserted nest of a squirrel, or occasionally in that of a magpie or carrion-crow, but I believe no materials are added by the owls to the original structure. The Lapp owl (*Syrnium lapponica*), a large and rare northern species, is said to build a large nest in trees. The late Mr. Wolley, in "Ootheca Wolleyana," edited by Professor Newton, gives it as his opinion that the eggs are usually laid in a depression on the top of a broken-off tree; but Professor Nilsson, in his work on the Scandinavian fauna, states on the authority of Herr von Seth, who took a journey into Lulea-Lappmark, in 1842, that this species of owl *builds* a very large nest in a high tree, where it lays several white eggs. Mr. Wolley also mentions an instance in which two eggs were brought to him from Kurkio-Vaara, in Kemi-Lappmark. The nest was stated by the finder to have been made of sticks and loose rubbish, and to have been placed about twenty feet from the ground in a large Scotch fir-tree. His informant also alleges that it was not a new nest, and was about two feet in thickness. The eagle owl in its wild state is an inhabitant of the greater portion of Europe, though only a rare visitant of the British Islands. It

becomes more plentiful in North Europe, being most common in Norway, Sweden, and parts of Russia. In the first-named country it is found both in the pine-forests and on the mountains, though from my own observation I should imagine it does not extend so far above the snow limit as the snowy owl, which is almost entirely Alpine in its habits. The eagle owl is a very powerful and voracious bird, feeding principally (in Norway at least) on mountain hares, ptarmigan, and black-game. I have been also informed by the peasants in several parts of Norway that the eagle owl will occasionally carry off young lambs when the sheep are driven up to the mountain pastures in the spring, and from its great size and strength I should consider it quite capable of doing so. The capercaillie is said often to be attacked by the eagle owl while roosting at night in the pine-woods, and sometimes to escape by diving from its perch to the ground among the tangled network of the lower branches of the tree, whither the soft-plumaged owl is unable to follow it. An allied species in America (*Bubo virginianus*) attacks the wild turkey, and is reported to be baffled by the same means. In size the eagle owl measures rather more than two feet in length, and nearly six feet in extent of wing; the male being, as is usually the case among birds of prey, somewhat less than the female. The

former would weigh from 6 to 7½ pounds, and the latter from 7 to 8½ pounds. The iris of the eye in the living bird is of the most vivid orange, giving it a very fierce aspect. When excited, the eagle owl raises its feathers and extends the wings laterally to their full expanse, snapping its beak and hissing at the same time. It seems to expand to twice its usual size when the feathers are raised in this manner. My specimens, except at the nesting season, are very tame, and will allow me to stroke them, though any attempt at familiarity on the part of any one they were not acquainted with would be instantly resented. They generally become most active about twilight, but the full glare of the sun does not seem to cause them any annoyance; and I have seen in the mountain districts of Norway both the eagle and snowy owls in search of food during the brightest portion of the day. The most common call-note of the eagle owl is a deep sonorous hoot, repeated two or three times in succession; both sexes utter this cry. The male bird also utters a sharp bark, so like that of a small dog, that my dogs generally answer it, imagining it to proceed from some canine intruder. Sometimes also at night these owls utter a most peculiar sound, quite distinct from their ordinary hoot.

It may perhaps interest the members of the society if I conclude this paper by describing a

visit I paid to an eagle owl's eyrie in Norway in the autumn of 1871, on which occasion I was fortunate enough to see the old birds, and two fully-fledged young ones which had left the nest some time, but which still remained in its immediate vicinity, and were supplied with food by their parents. While on the Hardanger mountains in Western Norway, on a deer-stalking excursion, I had several times heard the call of the eagle owl at night in the vicinity of my camping-place, and on asking the hunter I employed if he knew of any nesting-place of the "berg uggla" or eagle owl in the neighbourhood, he informed me that a pair had bred during the summer in a high cliff about two English miles from the place of our camp, and that while on the mountains, about six weeks before my visit, he had several times seen the old birds carrying hares to their broods, and that on one occasion the male had driven off a white-tailed eagle that had approached their nesting-place. Next day the weather was unfavourable for deer-stalking, so I determined to visit the owl rock, and endeavour to see something of its occupants. I found the place which my guide described as the haunt of the owls to consist of a large rugged extent of schistose rock, facing the south, and broken up into crags and ledges which rendered it tolerably easy of access. At the foot of the cliff there was a "snee fond" or

small snow-field, about 300 yards in length by seventy in breadth, which had remained unmelted during the summer. The cliff itself rose to a height of about 300 feet above this, and I examined it carefully with my field-glass before making the ascent, hoping to obtain a view of the owls. I could see nothing of them, so climbed up the most practicable part of the rocks, and on arriving at one of the ledges which traversed the face of the cliff, on which grew *Ranunculus glacialis* and *Saxifraga oppositifolia* in great luxuriance, perceived traces of the owls in the shape of ptarmigan feathers, feet of mountain hares, and several half-devoured bodies of lemmings. I stopped here for a few minutes, and presently saw an eagle owl rise from the face of the rock some distance above me, and, sailing along the face, alight about fifty yards further on. I crawled cautiously along the narrow ledge for a little distance, till I was enabled to look round a projecting corner. I then saw the two young birds crouched together on a rocky shelf, about eighty yards from me, the female sitting close by them, and the male bird perched on a projecting crag above. They seemed evidently suspicious of danger, as the old birds glanced constantly around them, and seemed to be aware that some enemy had approached them. I watched the family group for some time, the young having seemingly been

hatched late in the season, traces of down being apparent on their heads, and the tufts being undeveloped. I left them without disturbing or injuring them in any way, and was very much gratified by being able to see these noble birds in their natural state.

## THE WILD REINDEER OF NORWAY.

### (*Tarandus Rangifer.*)

HAVING had good opportunities of watching the habits of the wild reindeer in the Norwegian mountains, I am tempted to offer some slight account of its natural history, together with my own experiences in stalking the animal, which may possibly prove interesting to the readers of *Land and Water* (February, 4, 1871.)

At the present day the wild reindeer is found in considerable numbers on the higher mountain-ranges, or "fjelds," of Norway, though it frequently migrates from one district to another, constantly travelling against the wind, and rarely remaining long in any particular locality. Its principal food in the summer consists of the dwarf willows, *Salix glauca* and *hastata*, on various species of *Cerastium*, and especially on the *Ranunculus glacialis*, generally known in Norway by the

appellation of Rein-blum, or reindeer-flower, and which only grows above the birch limit, about 3,700ft., and among the regions of perpetual snow, where its pink and white flowers may constantly be found during the summer and early autumn. During the winter months the reindeer subsists almost entirely on the well-known reindeer moss, *Cladonia rangiferina*, which grows on nearly all the higher parts of the fjeld, and in search of which the deer in winter scrape up the snow to a great depth.

At the commencement of spring the reindeer descend from the snowy ranges to the lower parts of the sub-Alpine regions for the purpose of feeding on the sweet young grass which then is springing up; but as soon as the weather becomes warm, and the flies begin to appear and trouble them, they return to the highest fjelds to escape the plague of insects. The fawns are produced in May; and, unlike the generality of the deer tribe, are not spotted, but when first born are of a reddish brown colour. In August this changes to a blackish tint, which gradually becomes dark grey. In the adult deer the winter coat is extremely long and thick, varying in hue from reddish brown to nearly white. The males at this time have a long ruff of white hair on the neck and throat, which adds much to their stately appearance. This thick coat

comes off in large flakes in the summer, and at this time the general colour is greyish black.

Both sexes are furnished with horns, but those of the hind or "simla," as she is called in Norsk, rarely exceed nine or ten inches in length, while those of the stag or "rein" sometimes reach a very great size. A pair in my possession, taken from a deer shot by myself in October, 1870, present the following measurements :—

| | Inches. |
|---|---|
| Length of antler following curve ... | 47 |
| Width of antlers ... ... ... ... | 41 |
| Length of brow-antlers ... ... | 14—15 |

The total number of points, including the small ones on the brow-antlers, is 37; but the head is an unusually fine one, and such dimensions are not often attained. I hope in a future article to give a detailed account of reindeer-stalking, and to describe the circumstances under which I was fortunate enough to obtain the above-mentioned animal.

In the male reindeer the horns do not lose the velvet or attain their perfect development till the middle of September, at which time the animals are in their best condition.

The horns of the stag are shed about the second week in December, but the hinds and young stags retain theirs till the ensuing March.

The rutting season begins early in October, and

the deer at that time collect in large herds. The stags at this time are very pugnacious, and desperate battles take place between them, in which their horns sometimes become locked, and are occasionally broken short off.

During this period the males frequently utter a peculiar hoarse roar, which has a most startling effect when heard at night among the mountains, and which certainly would not be attributed to a ruminant animal. I have frequently at night, when camped out on the fjeld, listened to rival stags answering one another at various distances, their deep voices re-echoing from the rocks, and forming a most impressive concert.

The Norwegian reindeer is evidently specifically the same animal as the North American cariboo; for though minor differences of form may exist in various individuals, the habits and character of the two animals are the same. The cariboo, however, seems, from the information I have been able to gather about it, to be less of a mountain-loving animal than the European reindeer, and to frequent the extensive pine barrens and open plains of Northern America in preference to the snow-clad mountain fastnesses inhabited by its Norwegian congener.

The broad-spreading hoof of the reindeer is admirably adapted to support the animal in its

passage over soft snow, or among slippery rocks. Indeed, in powers of climbing, I fancy it is exceeded by few mountain-loving quadrupeds. I remember on one occasion seeing three deer that had been disturbed gallop at full speed along a narrow ledge on the face of an almost perpendicular cliff, with a precipice of more than a hundred feet below them, and down which a single false step would have hurled them.

A peculiar clicking noise is heard when the animal is in motion, occasioned by the contraction of the hoof when the foot is raised from the ground, and the consequent striking of the two portions of the hoof against each other. In descending precipitous slopes of rock, they obtain increased security of foothold by the use of the spurious hoofs, which, as in the case of the chamois and other mountain animals, are capable of considerable holding power. The hind legs are much longer in proportion to the others than is usually the case among the deer tribe; and this peculiarity of structure is of great assistance to the animal in traversing rocky ground.

In size a full-grown reindeer stands rather more than four feet at the shoulder, but some individuals attain a much larger size. The horns seem to attain their full growth at the age of from seven to nine years. In the young deer they are first repre-

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sented by a pair of single points. The brow-antler appears in the second year, and the other branches are gradually assumed, though individual specimens vary much in size and symmetry of antlers.

The variety found in Spitzbergen appears to be much inferior, both in size and in the development of the horns, to the Norwegian specimens. Several heads, evidently of adult deer, from Spitzbergen, that I have had the opportunity of examining, had the number of points at the top of the horns very irregular, in some instances there were two or three points on the summit of one horn, and only the single beam on the other.

There is also much difference in appearance between heads from various parts of Norway, some being much thicker and heavier in the beam than others.

One peculiarity in the reindeer seems to consist in the fact that more than one brow-antler is seldom formed, the place of the other being marked by a rudimentary tubercle. The large head, of which measurements are given in the present article, is an exception, as two brow-antlers exist, one being smaller than the other.

There is a prevailing idea that the reindeer uses its broad frontal antlers to plough up the snow in winter when searching for the moss on which it principally subsists during that period; but this, I

fancy, must be a mistake, as the old stags, which only possess these horns, shed them early in the season. The true state of the case is as follows :—

During the severe weather the deer unite in large herds, and resort to the highest part of the fjeld, where the snow does not lie very deep, on account of the constant gusts of wind which sweep over it. The largest and most powerful males go slightly in advance of the herd, and scrape up the snow with their fore feet, but having reached the moss, they are quickly driven away by the hinds and young stags, which retain their horns, and are thus easily able to keep off their more powerful companions. An experienced hunter, who was with me for some time in the mountains, assured me that he had witnessed this occurrence repeatedly.

The experiment of keeping herds of tame reindeer was tried extensively in various parts of Norway some years ago, the deer being principally procured from the Laps in Finmark and Nordland. It was, however, found not to succeed on a large scale, as packs of wolves were attracted by the tame herds, and caused great havoc among them, especially in winter. I was informed by a former owner of a large quantity of deer, that in the winter of 1865, fifty-six of his reindeer were destroyed by wolves in three nights. Moreover, the Norwegians did not take the same pains with the management

of the herds as the Laps, who almost identify themselves with their deer, live constantly with them, and being a nomadic race, these animals forming their sole source of wealth, accompany them in any partial migrations they may make in search of fresh pasturage, and are constantly at hand to protect the herd against the attacks of beasts of prey. In consequence of the constant depredations committed by wolves, the keeping of tame reindeer was almost entirely given up, and there are comparatively few now in Norway proper. There is, however, a herd of about 300 near Vossevangen, between Gudvangen and Bolstadoren.

The tame deer are considerably smaller than the majority of the wild specimens, and the horns do not attain anything like the same magnificent size. The colour is much the same, though white and greyish-white individuals occur more frequently in the tame variety.

In Finmark the tame reindeer are greatly tormented in the summer by a species of breeze fly, *Œstrus tarandi*, which I believe is peculiar to the animal; this insect, called *Snupok* by the Laps, lays its eggs on the hair of the deer's back, and the larvæ, when hatched, eat their way beneath the skin, where they, like those of the *Œstrus* of England, which attacks cattle, form a considerable swelling. These larvæ, called *Kurbma* in Lappish, occasion

great pain to the deer, and the herds, when in a district infested by the flies, frequently become almost frantic with terror.

In former times great numbers of wild reindeer used to be captured in Norway by means of pitfalls, dug on the fjelds. These contrivances, called "Reingraven," were commonly constructed on the mountain slopes, and near the favourite drinking places of the deer.

I have seen many remains of them, but as the present game laws of Norway forbid their use, they have been filled up. In form they were oblong, from six to eight feet in length, and about two and a half in breadth, and five in depth, the sides being built with flat stones. They were covered with small sticks and brushwood, over which a thick layer of reindeer moss was laid, and branches of the dwarf willows were strewed about to entice the deer to the spot. Of course, when the poor animal trod on the concealed spot, it was instantly engulfed, and its struggles to escape were rendered useless by the depth and narrowness of the snare. An ingenious and somewhat similar method of capturing the American "cariboo" is practised by the Esquimaux inhabiting the country to the southward of Chesterfield's Inlet. The sides of this trap, according to Dr. Richardson, are built of slabs of snow, cut as if for a snow house. An inclined

plane of snow leads to the entrance of the pit, which is about five feet deep, and of sufficient dimensions to contain two or three full-grown deer. The pit is covered by a large thin slab of snow, which the animal is enticed to tread upon by a quantity of the lichens on which it feeds being placed conspicuously on an eminence beyond the opening. The exterior of the trap is banked up with snow so as to resemble a natural hillock, and care is taken to render it so steep on all sides but one, that the deer must pass over the mouth of the trap before it can reach the bait. The slab is sufficiently strong to bear the weight of a deer until it has passed the middle, when it revolves on two short axles of wood, precipitates the deer into the trap, and returns to its place again, in consequence of the lower end being heavier than the other.

In Russian Finland another plan, called "Vild Ren Hage," of capturing the animal is adopted. A kind of fence about two miles long is constructed of small trees matted and interlaced with brushwood. Openings are left here and there, about three feet in width, and two stout posts are driven into the ground on either side; to one of these is fastened a strong noose made of tolerably thick rope, which is made to retain a circular form by means of small sticks. It is said that the deer when they meet with these hedges, which are generally made when

they resort to the lower grounds in spring, proceed along them till they come to one of these openings, through which in forcing their way, one of their number is usually entangled in the noose.

In Norway, at the present day, the animal is stalked, and exceedingly hard work it is, considering the rocky and precipitous character of the ground to be traversed, and the wild and wary nature of the quarry. There is a Norwegian saying to the effect that "the rein has good eyes and ears, but his nose—that is a marvel;" alluding to the exquisite power of scent possessed by the animal, which enables him to detect the approach of a human being or a beast of prey at an immense distance. Indeed, a friend of mine who has had considerable experience in Himalayan sport assures me that he has found that reindeer stalking requires as much skill, patience, and bodily endurance as the pursuit of the ibex, burrell, and tahir in the great mountain ranges of India and Thibet.

The circumstances under which I shot my first deer were as follows:—

I had been camped out on the mountains for several days, living in a small tent, and having a Norwegian hunter as my companion, with whom, as I had made some progress in learning Norsk, I got on capitally; he could not speak a word of English, but was well acquainted with the habits of

the animals and birds frequenting the wild rocky region in which we were.

Our tent was pitched on the banks of a small lake, with one or two tributary streams running into it. There were considerable numbers of trout in it, identical in species with our *Salmo fario*, though they would seldom rise at a fly. We had had several blank days, seeing deer on one occasion, but having stalked within about 900 yards, a sudden puff of wind gave them our scent, and our chance of a shot was spoiled. However, one day, after a long tramp over frozen snow and beds of jagged gneiss rocks mingled with shingly broken fragments of mica slate and ironstone, on the sandy margin of a small lake, whose waters were fed by small rivulets from a huge mass of half-melted snow and ice on one side of it, we came across the spoor of four or five reindeer. The track was fresh and the deer had evidently passed a very short time before, for some plants of *Ranunculus glacialis* growing close by were still wet with saliva in the places where the leaves and stalks had been cropped. A high stony ridge covered with shingle and large scattered stones was in front of us, and up this the spoor evidently led. It was about 11 A.M., and as we knew that it was the habit of the reindeer generally to rest at this period of the day, after feeding in the earlier portion of the morning, we were greatly in hope of

making a successful stalk. We cautiously crept up the brow of the hill, and on raising my head inch by inch, on arriving near the top, I had the satisfaction of seeing five deer lying down on a patch of snow about 600 yards off.

They had evidently neither seen nor smelt us, as the wind was favourable, but were in a most difficult position, as there was a perpendicular cliff behind them, and if we had attempted to descend the slope we should have been in full view. The herd consisted of a fine full-grown stag, with massive, wide-spreading antlers, a younger male, apparently about four years old, and three hinds. The stags lay still contentedly chewing the cud, but one or other of the hinds got up every now and then and walked round the group in a restless manner, snuffing the air, and evidently keeping a sharp look-out for any approaching danger. We lay concealed for some time behind a large boulder, attentively examining the ground and trying to find out some means of approaching within shot. At last we noticed some broken rocks to the right of the deer that we thought might be reached by making a considerable detour, and under the shelter of which we might crawl up within shot.

Down we crept as cautiously as possible, taking care to place our feet so as not to allow pebbles to roll down, and above all to prevent the rifle barrels

clinking against the stones. After about half an hour's caterpillar-like progress, great part of which was in the bed of an icy-cold mountain stream, we reached the masses of disrupted rock, and at length found ourselves within 150 yards of the deer. For the first time I had the opportunity of a good look at these splendid animals in their wild state.

They were still lying down in a variety of postures, with the exception of a sentinel hind that moved about in an uneasy manner, and once came within eighty yards of us. The old stag was furthest off, and in such a position that it would have been almost impossible to have fired with any chance of success. Clearly, the only thing to be done was to wait patiently until he rose to feed. At last, after a long period of suspense, the deer rose one after another and stretched themselves after their siesta. The stag was the last, and as he slowly got up I took a steady aim behind his shoulder, and pulled the trigger. He gave a convulsive bound in the air and fell struggling on the snow. The other deer dashed off in headlong flight, and I missed a snap shot at the young stag, the bullet striking a rock just above him. The old stag proved a very fine beast, having 23 points, and being in perfect condition. The horns measured 45 inches in length and 39 in extent.

Some time after shooting the deer mentioned in

the former part of my article, I was camped on the fjelds in a different district, where, on account of a change in the wind, I thought there might be a good chance of obtaining sport. The weather had been excessively cold on the mountains for some days, and a considerable amount of snow had fallen —a by no means unfavourable circumstance, as we were enabled to perceive the tracks of the deer with greater distinctness.

I should decidedly advise any sportsman who may feel disposed to try reindeer stalking to bring out a tent from England, as the only shelter to be obtained on the fjelds consists of small huts, called *lægers*, constructed of stones and brushwood. In these hovels, during rough weather, gusts of wind and rain find their way through every crack and crevice of the walls, rendering the whole place damp and wretched in the extreme. It is by no means pleasant to come back wet and tired after a twenty miles' scramble over all sorts of difficult rocky ground, to find the floor of your hut a liquid mud bath, and to have a constant drip of water descending on you from the roof and side walls. Moreover, the only fuel to be met with in the lofty regions frequented by the reindeer consists of the dwarf willow and a small species of juniper. These shrubs, when ignited, exhale a pungent smoke, which affects the eyes in a most disagreeable manner.

My readers may imagine what a delightful abode one of these *lægers* must be in bad weather, and unless you are provided with a tent, there is no other shelter to be obtained on the fjeld, except the *sæters*, corresponding to the Swiss *châlets*, which are situated on the pasture-grounds in the lower parts of the mountains, and in which the visitor is pretty sure to make the acquaintance of many lively specimens of the genus *Pulex*. There are two or three of these *sæters* on the high road between Nystuen and Leirdalsören, and I fancy if the curiously disposed pay them a visit they will find my description by no means overdrawn.

However, to return to the deer. I had heard that an unusually fine stag had been seen in that part of the mountains in which I was then camped, and I was determined to spare no trouble in order to bag him.

The ground we were on was more than usually difficult, consisting principally of large beds of broken rock, with small glaciers and deep declivities covered with soft snow, and here and there broken up by steep precipitous ravines, rendered slippery by rills of water.

My tent was, as usual, pitched by a small lake, where the ground was smoother, and covered with a thick carpet of grey reindeer moss. We had been prevented from going out on two or three occasions

by thick driving storms of snow and sleet, which obscured all surrounding objects, and rendered stalking impossible.

On a certain evening, however, the atmosphere cleared, and, after a most magnificent sunset, the sky appeared settled, and seemed to promise finer weather. Several times during the night I heard the hoarse grunting roar emitted by the stags at this season, evidently not far off, and as soon as daylight appeared we were up and stirring. The morning was beautifully clear, the snow-covered cliffs and glaciers being tinged with a pale rose-coloured light, which grew brighter as the sun gradually rose above the horizon; two or three ravens were hovering in the air, and the snow bunting (*Emberiza nivalis*) and meadow pipit (*Anthus pratensis*) uttered their mellow call notes, and flitted among the rocks by the little lake.

On one side of our camp there were some high cliffs, and above a snow slope of considerable extent. This, again, was bordered by rocks and large masses of boulders, mingled with patches of snow. About this part of the fjeld we expected to find the deer, as in the rutting season they generally resort to rocky ground.

We had a long scramble over the rocks, seeing but few objects of interest except a fine golden eagle, which soared in circles round us for a

considerable time. This species is by no means rare in the mountainous districts of Norway, usually building its nest on ledges of rock. Though I have seen a nest of this species of eagle in the autumn after the young had flown, I was unable to reach it to investigate its structure, as it was built on a small ledge of rock that projected from the face of a steep precipice, and without ropes it would have been impossible to have examined it. The white-tailed eagle (*Haliætus albicilla*) seems almost entirely confined to the coast and the vicinity of the larger fjords, building on the cliffs which overhang the water, and generally placing its nest in even more inaccessible situations than the golden eagle. At length we reached the summit of the cliff, and after both the hunter and myself had examined the ground carefully with the glass, we detected fourteen deer on one of the smaller snow patches among the *débris* of shingly rock. The wind was blowing from them to ourselves, and by making a circuit so as to avoid the snow slope before mentioned, we hoped to creep up under cover.

We accordingly started, keeping concealed as much as possible when passing any ground that might possibly be in the view of the watchful deer, and scrambling with as much speed as we could over the shattered masses of rock when we thought they could not observe us. Several times during

our progress we distinctly heard the peculiar roar of the stags, and hoped their attention might be sufficiently taken up by their combative intentions to enable us to get within shot. At last, after a long, tedious stalk, we reached a mass of loose stones, under the shelter of which we could approach with comparative ease without being perceived. We soon reached a large rock, from behind the shelter of which we were enabled to watch the deer. Three of the fourteen were fair-sized stags, none of them, however, having fine heads; one was a young stag about three years old, and the remainder hinds.

One of the stags evidently had the mastery over the others, and kept walking round and round the hinds, which were huddled up in a mass, and every now and then he would make a dash at any of the other males that ventured to approach them, and drive the aggressor off to some distance. I noticed that one of the stags had a large portion of one of his horns broken off, and I believe this circumstance is far from an unfrequent one, as they fight most desperately.

We remained for a long time watching the movements of the deer, as they were in a most difficult situation, on a large patch of snow, so that it was impossible to approach nearer than 500 yards without being seen.

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At last the larger stag, having driven the others to some distance, began to move slowly off with the hinds, when the herd suddenly closed together in a startled way, and on looking up I saw a magnificent stag standing at gaze on a rock some distance above them. He was by far the finest I had seen, and his form seemed dilated to gigantic proportions as he stood on the crag with his wide-spreading antlers clearly outlined against the sky. He did not remain long in that position, but stretching out his neck, uttered a roar, which was answered by the other stags, and bounded over the rocks at full speed towards the herd. The younger stags scattered in dismay at his approach, but the largest of them advanced to meet this trespasser on his boundary. He had not much chance, as the newly arrived stag charged him immediately, and bore him back completely on his haunches by his vastly superior weight and strength. His opponent struggled and resisted for some time, but with little success, and after a few minutes' struggle the new-comer drove off the other males to some distance.

I saw that his attention was absorbed by the others, and scrambled down among the rocks, keeping myself as much concealed as possible behind the blocks of stones ; and a lucky movement of the hinds in my direction brought the great stag within 200 yards of me. I saw there was no chance of

getting nearer, so arranged the sight and fired; but unfortunately, as he was trotting at the time, did not aim sufficiently forward, so that the bullet, which ought to have taken him just behind the shoulder, struck in the middle of his body. He rolled over, raising a cloud of snow, and I thought I had killed him. The rest of the herd bolted off, and turning quickly round a projecting cliff, prevented my obtaining a second shot at them. I reloaded, and with the hunter proceeded towards the fallen stag. When about a hundred yards off, he suddenly sprang up, and bounded off with apparently undiminished vigour. A second shot finished him, and I had the satisfaction of obtaining this splendid animal. The measurement of his horns is given in the first part of the present article.

P.S.—This head, together with several others, was stuffed by Mr. J. Baker, of Rose Crescent, Cambridge, who, I think, has succeeded extremely well in reproducing the expression peculiar to the animal.

# BRITISH BATS.

## Part I.

Though upwards of nineteen species of *Cheiroptera* are found in Great Britain, your readers may possibly be unacquainted with some of their most interesting habits and structural modifications. For a long time the anatomy of the bats was but little understood, and they were placed at the end of the mammalian class, being considered to form a connecting link between the quadrupeds and birds, and it was left to more modern naturalists to refer them to their true position in the scale of creation. The first peculiarity which strikes the eye is the membrane which enables the creature to launch itself in the air, and which can be wrapped round the body during the intervals of repose. This membrane is double in structure, and extends to the extremities of the limbs, leaving the hind feet and a small portion of the tail exserted. Indeed, we can form

a good idea of the so-called wings of the bat, by stretching our arms to their full extent, imagining the thumb changed into a hook, and the fingers elongated to the length of several feet, having a soft leather-like substance attached to the body, and so enveloping their extreme tips. To support this extent of wing the clavicles are long and arched in form, being firmly attached to the sternum and scapulæ—the vertebral formula in *Vespertilio pipistrellus* is as follows:—7 cervical, 12 dorsal, 7 lumbar, 3 sacral, and 12 caudal vertebræ. The sternum is very long, and there is a bony keel in the centre for the attachment of the powerful muscles that move the wings; the ribs are extremely long, and considerably arched, so as to afford plenty of space for the action of the thoracic viscera. The teeth in the insectivorous *Cheiroptera* are studded with sharply pointed tubercles, and the jaws are only capable of vertical motion. In the formation of the skull the occipital condyles are subterminal, the super-occipital slope backwards, and join the crista, continued forwards by the interparietal and parietal bones. The occipital foramen is very large. The premaxillaries are extremely small; in one of our British species, the great horse-shoe bat (*Rhinolophus ferrum equinum*), they are wanting. By means of the sharp claws of the hind feet, and the hook-like projection on the

thumb, the bat can climb with great ease up the rugged surfaces of walls and the bark of trees; but on level ground its progression is extremely awkward. It first moves forward the hook on the wing so as to take hold of any slight projection, and then advances the hind foot on the same side, thus tumbling forward in a succession of clumsy jerks. In climbing up walls they crawl backwards, raising themselves against the object they desire to scale, and moving up by the alternate use of their hinder feet.

When resting they suspend themselves head downwards, so as to enable them, if desirous of taking flight, to do so by merely expanding their wings, and releasing their foot-hold. In this singular position they hibernate during the winter in a state of lethargy. Church steeples, hollow trees, old barns, caverns, and similar situations form their favourite retreats, and vast numbers are often found crowded together and forming a compact mass. One hundred and eighty-five were on one occasion taken beneath the eaves of Queen's College, Cambridge; they were all of the same species, the noctule (*Noctulinia altivolans*), almost the largest species found in England, commonly measuring from fourteen to sixteen inches in expanse of wing. The pipistrelle, our most common species, and the long-eared bat (*Plecotus auritus*)

are the first to awake from their dormant state. These usually appear in early spring and remain lively until the cold weather sets in and their insect food cannot be procured. The noctule, or great bat, is first seen in April, and generally seeks its winter-quarters about the end of September. On account of the exquisite sensibility of the nerves in the skin of the bat's wings, these animals are enabled to avoid obstacles in their flight in the most marvellous manner. If a bat is placed in a darkened room, with transverse strings placed across it in various directions, it will steer itself between them without striking against or even touching them in its rapid movements.

The different species of bats differ considerably from one another in their manner of flight. The pipistrelle flits generally near the ground, making rapid and zig-zag turns in its flight, and frequently darts off at a tangent in chase of a passing insect. The noctule, on the contrary, will sometimes hover like the kestrel, or swoop through the air, at a considerable height, in widely extended circles, the distinctive name of *altivolans* having been applied to it on account of its lofty flight. I have seen numbers of this bat wheeling round the high trees in the walks at the back of Trinity and St. John's College at Cambridge, in pursuit of the cock-chafers (*Melolontha vulgaris*), which were emerging

from the pupa state in great numbers; only the soft abdomen of the insect was eaten, the horny elytra and thorax being invariably rejected. These insect-remains were to be found strewed about in great numbers beneath the trees.

The long-eared bat frequently loves to course to and fro in lanes with a flickering, irregular flight, and feeds in a great measure on the ghost moth (*Hepialus humuli*), which, during the earlier part of the summer, is numerous in such situations. The voices of all the bats are singularly shrill in character, and have a peculiar effect when several individuals are darting about in company. In their flight they evidently use the tail as a rudder to steer by, being enabled by its use to turn themselves rapidly. It can also be employed as an organ of prehension, as I have frequently noticed my tame bats hitch it over a projection, or between the wires of their cage, when traversing it. I have kept several species of our bats, and found that most of them could be tamed to a considerable extent, the long-eared bat being perhaps the most docile, and easily rendered familiar. Some specimens of the noctule lived in my possession for a considerable time, and afforded me much interest and amusement by the insight they gave me into their habits and curious mode of life. They were taken by myself in a hollow tree, and consisted of

two females and a male, the latter a very fine specimen. On capturing them, I placed them in a large wire cage, and they immediately appeared quite at home, feeding freely on small pieces of raw beef, and on mealworms and cockchafers, rejecting, however, large flies. On seizing their food, the wings were immediately expanded before the animal, forming a kind of tent, beneath which the head and neck were thrust, the insect or piece of meat being disposed of by a series of pecking bites, the action of the jaws being apparently similar to the same organ in the cat tribe. Their olfactory nerve appeared to be peculiarly sensitive. When the bats were in a state of somnolence during the day-time, and were hanging by the claws in a corner of their cage, each looking more like a ball of brown wool than a living animal, if a cockchafer or mealworm was held to the wires of the cage, they would immediately awake and scramble with all possible haste to secure the coveted morsel. They lapped water freely, but did not raise the head after drinking, as I have noticed is the case with the pipistrelle and the long-eared bats. The noctules were most cleanly animals, combing their fur most assiduously with the claws of the hind-feet, and seeming to take especial care in forming a straight parting down the back. The wings were cleaned both with the feet and tongue, which latter

organ was frequently used in removing any extraneous substance that might have adhered to them. After having been in my possession some few weeks, one of the females produced a young one—a little dusky monster, covered with a wrinkled skin of a dull leaden colour, and having the wings as yet very imperfectly developed. Altogether, he presented a most imp-like appearance; and should any future disciple of Fuseli wish to paint anything more than usually grotesque or weird-like, I would decidedly recommend him to study from a young noctule bat. Towards the end of the second week the eyes opened, and a light brownish fur began to develop itself. The little beast seemed to enjoy life in an amazing degree, as, frequently leaving his mother, he would disport himself by a scrambling wallop through the cage. On his first appearance, I had removed the mother from the company of the other bats, and gave the interesting pair a large cage to themselves. The young bat grew rapidly, and at the end of the sixth week was able to eat moths and small pieces of raw meat moistened with milk. He was very playful in his quaint fashion, and for some time seemed to regard his own partially developed wings with considerable astonishment. Artemus Ward would certainly have described him as an "amoozin little cuss,"

and he might have even eclipsed the attractions of the kangaroo in the "onparalleled show."

The mother evidently seemed to consider him of the utmost importance, as she fussed about when any one looked into the cage, erected the fur on her back, and bit viciously at intruding fingers. The young bat throve wonderfully well and lived with me more than four months, when I gave him his liberty with the others, as I was afraid they might not bear the cold of the winter so well in confinement as if permitted to choose their own places for hibernation. This is, I believe, the only instance in which a nursling bat has been brought up successfully. Knowledge of the habits of an animal, proper food supplied at the right times, and careful attention to cleanliness will however work wonders. For these reasons I have never had a single case of distemper among my dogs, and have been equally successful in breeding and rearing several species of dormice, squirrels, birds, and various reptiles. I have also had several specimens of the pipistrelle in my possession at various times, and found them differ in their habits from the noctules. The former preferred bluebottle flies (*Musca vomitoria*) and *M. cæsar* as food, and I found myself freed from considerable trouble in procuring them a supply of nourishment, by placing a piece of raw meat in their cage, so that they

might feed on the flies attracted by its presence. They would sometimes seize the flies with their teeth ; but the most common mode of capture was to knock them down with a sudden stroke from the end of the wing. They rapidly became tame, and would take flies from my fingers. This species is much less in size than the noctule, measuring only eight or nine inches in expanse of wing, and being more than proportionably slighter and more delicate in form. In a subsequent article he treated of the other kinds found in Great Britain, and especially of the most beautiful species, the long-eared bat, *Plecotus auritus*, as follows :—

The long-eared bat (*Plecotus auritus*) is one of the most plentiful of our native species ; and from the peculiarities of its structure and appearance, it cannot be mistaken for any other kind occurring in this country. The fur is long, fine, and silky in texture, of a dusky, brownish grey colour above, and yellowish-grey beneath ; the extremity of the tail projects very slightly beyond its enveloping membrane, and is more curved in form than that of most other bats. The most striking distinction, however, between this species and the others consists in the enormous comparative size of the ears, which can be thrown into the most delicate wave-like curves, presenting a singularly beautiful appearance. During rest, these immense ears are

folded back along the sides, the pointed inner ear, or tragus, alone projecting. I have kept several specimens of the long-eared bat, and found that they became tame more rapidly than the other species, permitting themselves to be freely handled, and feeding eagerly on flies and raw meat. This bat seems also more active on the ground than the other kinds, shuffling about with greater ease, and possessing the power of raising itself on the wing from a flat surface. The young long-eared bat, when first born, is destitute of fur, but in the space of a few days gains a light brown covering, very downy in texture, and which is replaced by the permanent coat at about the age of six weeks.

The long-eared bat seems especially to frequent fenny and marshy districts, particularly where there are lines of pollard willows, as it feeds in a great degree on the various species of caddis flies (*Phryganeæ*) which emerge from the pupa state during the earlier part of the summer, and hover about these trees. This bat is more delicate in structure than the others, the bones being slighter in form, the thorax is short and broad, the upper part of the sternum very long, the clavicles very long, slender, and curved, the hind legs are comparatively short, the tarsus very small, the metatarsus short, the feet being capable of being turned nearly round in an inward direction. The number

of vertebræ is as follows:—cervical, 7; dorsal, 11; lumbar, 7; sacral, 4; and caudal, 10. There are four incisors in the upper jaw, the two middle ones slightly separated, two canines, and five molars; the first, small and conical, the second, larger with a conical point, and the last three nearly equal, with several small points. In the lower jaw the incisors are six, the canines two, with an internal acute process, the anterior conical molars, and three posterior molars, each with three points. The jaws are incapable of being moved laterally, and the bat feeds by a succession of pecking bites, just as a cat does when engaged with a tough piece of meat. The voice of the long-eared bat consists of a chirping kind of squeak, not so shrill as the cry of most of its congeners, and resembling the voice of the shrew (*Sorex tetragonurus*) so frequently heard in hedgerows and banks during the summer. The dimensions of these bats are as follows:—

| | in. | lines. |
|---|---|---|
| Length from nose to root of tail ... | 2 | 1 |
| Length of tail ... ... ... | 1 | 10 |
| Length of ear ... ... ... | 1 | 8 |
| Extent of wings ... ... ... | 10 | 2 |
| Humerus ... ... ... ... | 0 | 11 |
| Cubitus ... ... ... ... | 1 | 4 |
| Second finger ... ... ... | 1 | 3 |
| Third finger ... ... ... | 2 | 7 |

The next species that comes under our notice is

the barbastelle (*Barbastellus communis*). This bat exhibits a considerable affinity to the *Plecoti* or long-eared bats. The ear is similar in form, but is smaller, or has the transverse ridges less prominent, and the sinus on the outer margin deeper. The tragus is more sharply pointed at its extremity than in *Plecotus auritus*, and the base is wider. The eyes are peculiarly small, and the nostrils are situated in a hollow space destitute of fur, and extending to the ears. The muzzle is also square and short. The fur is rather long, and very soft in texture; the colour on the head and back being brownish black, shading off into reddish brown on the hinder parts. This depth of tint on the fore-part of the body will alone readily serve to distinguish the barbastelle from any other of our known species of *Cheiroptera*. The throat, breast, and lower parts are dark grey, the ears, wings, and muzzle black. The dentition is as follows: Incisors, $\frac{4}{6}$; canines, $\frac{2}{2}$; præmolars, $\frac{4}{4}$; molars, $\frac{6}{6}$; total, $\frac{16}{18}$. The barbastelle is somewhat larger than the long-eared bat, a male for some time in my possession presenting the following measurements:—

| | in. | lines. |
|---|---|---|
| Length from nose to root of tail ... | 2 | 4 |
| Length of tail ... ... ... | 1 | 9 |
| Extent of wings ... ... ... | 10 | 7 |
| Humerus ... ... ... ... | 0 | 11 |

| | in. | lines. |
|---|---|---|
| Cubitus ... ... ... ... | 1 | 5 |
| Second finger ... ... ... | 1 | 4 |
| Third finger ... ... ... | 2 | 9 |

This barbastelle was taken in an old chalk-pit, near Aldenham Abbey, in Hertfordshire, and lived for some two months in my possession, being liberated towards the close of autumn, in order to seek proper hibernating quarters. It was much less familiar in its habits than the other bats, never feeding when it thought itself observed, and always carrying its food to the darkest corner of its cage; the wings, however, were never extended over its prey when feeding. My specimen seemed to prefer crickets (*Acheta domestica*) to every other kind of diet, entirely refusing raw meat, and seeming to look down on moths in much the same way as a charity boy might despise the customary stale bread and scrape after a good hearty gorge on plum-cake.

My barbastelle was a pugnacious little beast, and once had a regular "set to" with a male noctule, the barbastelle managing to squeeze himself through a very small aperture in the partition which separated them. My attention was attracted by hearing an unusual squeaking, and on looking into the cage, I found the two combatants firmly fastened on each other and rolling about in most

determined conflict. I separated them by sprinkling a few drops of water on them which cooled their bellicose propensities; and I lost no time in transferring them to their respective abodes. The great horse-shoe bat (*Rhinolophus ferrum-equinum*) is one of our native species that possesses that curious leaf-like membrane on the nose, so extensively developed in some of the South American vampire bats (*Phyllostoma*). This peculiar structure in the horse-shoe bat consists of two portions—the anterior, resembling a horse-shoe in form, and curving from the lips upwards, so as to surround the nostrils. The second leafy membrane rises from the forehead, and resembles a laurel-leaf in form, a basal lobe being place at each side, and the whole being fringed with stiffish hairs. The extent of wing in this bat is about thirteen inches; the length of the head and body being nearly three inches. The fur is reddish grey above and pale grey beneath; the ears light reddish brown. The only living specimen I ever saw of this bat was sent me from Rochester, having been taken in the cathedral; it unfortunately had received some injury in its capture, as it lived but a few days.

The lesser horse-shoe bat (*Rhinolophus hipposideros*) resembles the species last described in most points, differing only from it in the greater proportionate breadth of the nasal membrane, and the

lesser expanse of the wings. It was first discovered in Wiltshire by Montague, but has since been several times observed in the south of England. The large-eared, or mouse-coloured bat (*Myotis murinus*) is the largest of our native species, and also the rarest; the only specimens recorded to have been taken in this country were captured, as recorded by Mr. Jenyns, in the gardens of the British Museum. On the Continent, where it is abundant, it often congregates in the towers of churches and in old buildings in the same way as the noctule. The hinder part of the head, the nape of the neck, and back are reddish-brown, the face greyish, and the lower parts of the body of a greyish white hue. The wings are brownish, and the general tint of the body is said to deepen with age. The measurements, as given by Mr. Jenyns, are: length of the head and body, three inches, five lines; of the head, eleven lines; of the tail, one inch, eight lines; of the ears, eleven lines and a half; of the tragus, five lines; of the thumb, five lines. Extent of wings, fifteen inches.

The serotine bat (*Scotophilus serotinus*) was discovered by Daubenton on the Continent, frequenting woods and forests, and awaking from its state of hibernation at a later period than the other kinds. With us it has been obtained in the vicinity of London. The fur in the male is of a deep chestnut

above, shading into yellowish grey on the under surfaces. The wings and inter-femoral membrane are blackish brown. The females are much paler in tint, but the young males are deeper in colour than the adult specimens of their own sex. The serotine bat measures from twelve to fourteen inches in expanse of wing. A specimen of the parti-coloured bat (*Scotophilus discolor*) was taken at Plymouth by Dr. Leach, and is now in the British Museum. This is the handsomest of the European bats, the upper parts being of a rich glossy chestnut, dotted with white. The ears are rounded in form, their basal half being covered with thick woolly hair. The length of the head and body is two inches and a half; the extent of the wings ten inches and a half. In concluding this short notice of the principal species of bats found in England, I have endeavoured to embody the results of my own observation. The habits of animals can alone afford real and valuable information, as many living beings, though similar in specific characteristics, are widely removed from one another in mode of life.

## EXPERIMENTS WITH POISONOUS SNAKES.—COBRA, PUFF-ADDER, AND CERASTES.

I HAVE read with interest the account of F.Z.S., in No. 46 of LAND AND WATER, Dec. 1866, in which he describes his experience of a cobra. I therefore take the liberty of sending you the following account of a series of experiments on snakes which I have been fortunate enough to be able to make, with the view of obtaining information as to the poisonous properties of the different species. Venomous snakes shed their fangs several times a year, besides being liable to have them broken when striking at or swallowing their prey. To supply this want there are always other teeth in various stages of development on each side, behind those in use, so that, should one be broken or injured by any accident, another is always ready to supply its place. A curious fact in reference to poisonous reptiles consists in the circumstance that

should one be bitten by another of the *same species*, little or no ill effect ensues.

In confirmation of this, I have heard, on good authority, that several puff-adders, confined in a large box together, used to bite each other furiously whenever irritated, and none of them ever died of the results. Of course this does not apply to serpents of a different kind, as I have seen the American water viper kill a common English snake placed in the same case. In this instance the poison was some time in taking effect, as the snake writhed about for a long time, being bitten on the back of the neck. Even after an hour or two had elapsed a considerable degree of muscular irritability remained.

Our first experiment was tried with an Egyptian cerastes. This snake is remarkable for having above the eyes two small upright scales resembling horns, which peculiarity, together with the vertical pupils peculiar to the eyes of nearly all the poisonous species, gives it a far from engaging aspect. In this serpent we find a good example of how the colours of the reptilia are adapted to the localities they inhabit, with the view of rendering them less distinctly visible to their prey. Thus the scales of the cerastes, which lies half-buried among sand and dry soil, are of a reddish tint, while the vivid green of the beautiful tree-snakes is no less

adapted for concealment among the luxuriant tropical foliage. Just as in the cat tribe, we see how well the tawny colour of the lion harmonises with the sandy rocks among which he is found, and with what difficulty the striped tiger is distinguished as he crouches among the yellow jungle-grass of India, while the spotted leopard and jaguar can only be perceived by a practised eye as they lurk among the tree branches. But to proceed with my description. On a mouse being dropped into the case, the cerastes, after looking at it for a moment, made a rapid dart, bringing down his erected poison-fangs on the nape of the neck. The mouse, on being struck, fell almost immediately over on its side, dying in 1 min. 3 sec. On examining the body, I found the muscles of the neck in a highly inflamed state, and a good deal of coagulated blood about the place where the fangs had penetrated, the inner surface of the skin appearing as if mortified, though but a few minutes had elapsed since the infliction of the bite.

A half-grown rabbit was next placed with an Indian cobra, which was lying coiled up among the gravel at the bottom of his cage. As soon, however, as he was aroused by the rabbit falling in, he expanded his hood in the beautiful manner peculiar to the species, waving the head and neck at the same time from side to side, and hissing violently.

Presently he struck at the rabbit, but from some reason missed it, striking the glass front of the case instead, a couple of drops of poison being left on the glass. In a moment or two the cobra made another dart, and with better aim, striking the rabbit on the nose, and, soon after, on the back. Death ensued in 3 min. 28 sec. On opening the skin of the nose, I found the flesh and muscles much swelled, the wound inflicted by the fangs being marked by a small spot of congealed blood. The tissues of the eye were much inflamed, and there was a spot of dark matter near the posterior edge of the orbit. The pupil of the eye appeared glassy and semi-transparent. When dying, the rabbit appeared to have great difficulty in breathing. On cutting away the skin on the back, I found a large clot of decomposed matter mixed with blood extending over the region of the spine. The punctures of the fangs were on the line of the vertebræ, and one of them had pierced the large dorsal muscles, the flesh around and the muscles themselves being much swollen and inflamed.

A guinea-pig bitten by a puff-adder was struck on the belly, just above the large intestine. On opening the animal, the cæcum appeared unnaturally swollen, the small intestine being spotted with blood, and much inflamed. Though the guinea-pig had been dead only a quarter of an hour

putrefaction had already commenced, which rendered the dissection a far from pleasant task. A full-grown rabbit bitten by a rattlesnake died in 13 min. 5 sec., the wounds being on the lower part of the right ear, and very perceptible, externally the skin of the ear being clotted with blood. On opening the skull, I found the brain in a decomposed state, some parts being greenish, and charged with whitish matter, and others mixed with clots of putrid blood. Of course it is scarcely necessary to remark here, that after a snake has struck an object once or twice, and expended most of its poison, the powers become much enfeebled, and the bite then becomes comparatively harmless, though a fresh supply of venom is rapidly formed if the reptile is allowed to remain undisturbed.

## VARIETIES OF THE TIGER AND LEOPARD.

I WAS extremely interested by the admirable articles of "Zoophilus" on the tiger, and perfectly agree with what he states concerning the tameable disposition of this formidable beast, together with other powerful members of the great feline group. Certainly there seem to be but few, if any, animals which are not susceptible of the influence of man and cannot be rendered docile by an unvarying course of kind yet firm treatment, though the peculiar character of each specimen must be thoroughly understood, as various traits are found in different individuals of the same species, especially among the cats, some becoming rapidly familiar, while others which are treated with equal kindness will slink off into corners when approached, and there spit and snarl as if through an instinctive antipathy to the whole human race.

The wild cat at the Gardens, mentioned by your correspondent as an instance of this unreasoning

ferocity, is scarcely a fair example, as he was caught, when fully grown, on the estate of the Earl of Seafield, and except in rare instances the naturally savage propensities of these beasts are seldom materially overcome when the adult animal is transferred from a state of freedom to one of captivity. The four young tigers in the collection are extremely tame and affectionate towards their keeper, who has great skill in gaining the affection of the dangerous carnivora under his charge. They are in excellent health and condition, and bid fair to become noble specimens of their race. One of the tigresses has an unusual number of stripes, and in general depth of tint appears to resemble the skin "Zoophilus" mentions as having seen at Mr. Ward's.

I am greatly interested in the question of distinct species, or rather varieties, among the tiger and other large Felidæ. The tigers of the Altai mountains and Oriental Siberia appear to be much longer furred than those inhabiting the warmer portions of Asia. Even if not a separate variety, they present considerable distinctions, a friend having recently informed me that he had seen one of these skins, coming, I believe, from the Trans-Baikal region. He describes the fur as resembling that of an Angora cat in length. The colour was peculiarly light and the stripes indistinct,

but I should attribute this to the effect of age. Would it not be probable that this long-haired tiger might have a near affinity to the formidable felines whose fossil remains are found in the European bone-caves, and which, doubtless, at one time inhabited this island? Atkinson, in his interesting *Travels in Siberia and on the Upper and Lower Amoor*, frequently mentions this species, and states that he has seen several long-haired individuals in the museum of Barnaoul, which were shot in the immediate vicinity. One of these tigers was, he states, an unusually fine and powerful specimen, two or three men being destroyed by the ferocious beast before it was killed. This variety of tiger seems to endure cold with perfect impunity, the thick and warm coating of fur securing it from the effects of the intensely severe Siberian winter.

The Indian tigers in the Zoological Gardens assume a denser covering of fur about the end of autumn when the close and short summer coat is shed. It will be an interesting thing to ascertain whether the fur becomes longer or thicker at all during the rainy season in India, for though the tiger has not the same dislike to water so strongly implanted in the nature of the domestic cat, yet the sudden transition from the ordinary drought and aridity to the damp and steamy atmosphere

of the jungles during the monsoon, may have some effect on the system.

A second large species of Felis (*F. irbis*), described as being clothed with long whitish fur, having the spots very faintly defined, has been found north of the Mouztagh or Celestial mountains, which are in latitude 42 degrees. It may perhaps be identical with the snow leopard inhabiting the higher ranges of the Himalayas, which preys principally upon the ruminants that inhabit that lofty region.

This snow leopard is represented by Colonel Markham and Mr. Wilson as being found in considerable numbers in the upper parts of the mountains, but though tolerably numerous, it is so shy and cautious in its habits as to be very rarely seen. Mr. Wilson only shot one specimen, and that a half-grown cub, during his sojourn in the hills, which extended over a considerable period of time, and during which he collected nearly all the rarer Himalayan mammals and birds.

The *Felis irbis* above referred to exists also, I believe, in some of the Persian mountain ranges, being most probably the animal alluded to by Tennyson in his exquisite poem of "Œnone," where he so accurately describes the deep yet muffled voice of the animal as being heard from the pine-fringed mountain glens during the twilight

of early morning. This peculiar sound emitted by the leopard has been noticed by the natives of Eastern Africa, who have a machine for grinding, or rather crushing corn, which causes a similar noise, and is called by the same name, "nyal-ugwé." The voice of the leopard consists of three or four loud, harsh growls, repeated rapidly in succession, more resembling the sawing of large dry boards than anything else I can compare it to, while the jaguar of South America (*Felis onca*) commences by uttering a short roar like that of the tiger, followed by several grunts, dying away gradually in long-continued sighs. The puma (*Felis concolor*), on the contrary, mews like a magnified tom-cat, there being none of the majesty and consciousness of physical power so conspicuous in the roar of the tiger or lion.

I should be extremely gratified by having your correspondent's opinion as to the existence of *two* large spotted cats found in the jungles of India, inclusive of the cheetah (*Gueparda jubata*). The most common species appears to stand low on the legs, with a rather small head, and lengthened body, the ground colour being very dark, having the fur closely studded with rose-shaped spots which pass, however, into single dots on the head and limbs. A fine male and a young female of this variety are now living in the Gardens, the former being in

company with a pair of African leopards. It is usually termed "gorbâcha" by the natives. The larger kind, commonly called the *panther*, and which I believe to be the true "tendowa," stands higher on the legs, and is much more powerfully built, equalling a small tigress in size. A skin I have examined, which came from Coorg, had the ground colour pale fulvous yellow, the spots being widely separated from each other on the sides, but uniting on the spine in an almost continuous chain. The length of the skin was 8 ft. 9 in., which, allowing for the stretching, gives a very large and powerful animal. Two varieties of the leopard seem also to exist in Africa, as there is a large male from Morocco in the Gardens, which in size and colour resembles the skin just mentioned, while the other specimens approach the small Indian leopard in size and form, though their fur is of a pale tint. I am not aware of the exact place from whence they were sent over, but I believe from the Portuguese possessions on the eastern coast.

The investigation of these varieties would be of great assistance to zoology, as most probably more than one species remain to be discovered, and sportsmen and travellers would do great service to science by taking every opportunity of clearing up the question.

## EFFECTS OF VALERIAN ON TIGERS.

In Mr. Buckland's interesting article on lion-taming in No. 29 of Land and Water, he mentions the peculiar sympathy, or mesmeric power, that appears to exist between certain human beings and animals. This power seems to be acquired in a great degree by an intimate knowledge of the habits and nature of the animal to be tamed, of its various moods and variations of temper, and the proper time to take advantage of each. Any one in this manner, if sufficiently patient and kind with animals, can render many of them tame and affectionate towards him; but in some few cases there exists a more intimate relationship which gives the human being a complete power of moral control over the beast, and seems to affect the most ferocious specimens of the same class in an equal degree with those whose dispositions are milder, and more amenable to human influence. In like manner a few vegetable and mineral substances appear to exercise the same mysterious power over the feelings of the brute creation, and to

all appearance are able to soothe and cause them pleasure while under the influence of a fit of the most furious rage, or most supine and listless apathy. For instance, that cunning creature, the brown rat, seems entirely to have lost its cautious propensities when it smells the oil of rhodium or aniseseed, and will rush blindly into a trap or snare when touched by one of these extracts, which it would have shunned with aversion if baited in an ordinary way.

The castoreum or "bark stone" is used in a similar manner by the American trappers for the capture of the beaver. This substance is secreted by the beaver very much in the same way as the civet cat produces the well-known scent, and has a strong attraction for the members of the busy little flat-tailed community. The trappers always carry with them a supply of this castoreum in a small stoppered bottle, and when setting a trap dip the end of a twig into the odorous secretion, and place it so that its extremity just shows above the water, the trap being secured below the surface, so that the beaver while swimming to smell at the twig is in most cases caught.

Among the feline group the valerian plant (*Valeriana officinalis*), or its essential oil, appears to have an equally powerful effect, as mentioned by "Zoophilus" in his interesting articles on the tiger. I

have been enabled to try this valerian on these and other animals, and to compare the results produced. It appeared to have the strongest influence on the lion, tiger, and jaguar; these animals, when a drop was spilt on a piece of paper and placed in their cage, rolled over it in a state of the utmost apparent enjoyment, the males in *all* cases manifesting a stronger partiality than the opposite sex, and evincing the greatest recognition of its presence. The leopard, puma, and clouded tiger (*Felis macrocelis*) took less notice, and the cheetahs appeared to dislike the smell, their olfactory organs appearing in this way to resemble those of dogs, which dislike the scent of valerian as much as the true feline tribes enjoy it. The caracal, lynx, and the ocelots showed an especial liking, and were most demonstrative in their manifestations of pleasure. I tried the effect subsequently on various species of bears, but without causing any material symptoms of excitement, though an Indian sloth bear waddled about at a great rate, and rubbed himself vigorously against the bars of his cage when he smelt it. A female skunk scuttled round and round and ran backwards in a most ludicrous manner as soon as she perceived it, and, judging from her demonstrations of joy, appeared to think it in some way akin to the natural perfume of her species. Domestic cats, as is well known, will break down and roll

upon valerian plants in gardens, and a trap rubbed with a leaf or two will surely entice any luckless pussy which may unfortunately pass that way. There is an old distich moreover in reference to planting it, which runs thus :

> " If you sow it, the cat will know it ;
> If you set it, the cat will eat it."

Surely, therefore, as this valerian plant appears to exercise such an influence over the naturally ferocious natures of the formidable tribe of cats, it would have a powerful effect in rendering lions and tigers docile in captivity, and would make the position of a man entering their cage much safer, when he was thus able to cause them what, to all appearance, is the height of pleasure to their organization, as nearly all the so-called tame beasts of this class that I have seen seemed only to wait an opportunity for attack when their master's attention was removed. Vast things can certainly be done in the animal world by an unvarying course of kind yet firm treatment, but the natures of the larger *Felidæ* seem so essentially suspicious and uncertain, that a beast which a moment before may have been manifesting every appearance of fondness, might burst into a paroxysm of rage, which would prove fatal to the unfortunate human being against whom it might be directed.

## HABITS OF THE CHEETAH.

(*Gueparda Jubata.*)

In most of the principal classes of mammalia anomalous types occur, which, on account of their partaking of the distinctive features of more than one tribe, are by no means easy to arrange, and must in many cases be regarded as links connecting various genera. Thus, for instance, we have the aye-aye, an animal that appears intermediate in form between the galagos and rodents, resembling the former in shape and in its nocturnal habits, while it nearly approaches the gnawing quadrupeds in the arrangement of the teeth and mammæ. The colugo, or flying lemur, also seems transitional between the order in which it is usually placed and that of the bats, as the limb and tail are connected by a membrane that serves to support the creature in the air while leaping from tree to tree, and to carry it for some considerable distance. Many other instances might be brought forward, but we

will now pass to the extensive and formidable race of the felidæ. Among these beautiful and ferocious beasts, the cheetah, or hunting leopard, though in habits essentially a cat, in certain points bears a strong similarity to the canine group. On a first glance the peculiarities of structure might not be noticed by an inexperienced eye, as the animal in question closely resembles the true leopard in form and general appearance, though the spots, instead of being placed in clusters are scattered singly over the skin. However, when viewed more closely, it will be observed that the head (though dilated at the sides for the attachment of the powerful muscles that lend such force to the jaws of the cats) differs considerably in form from the more typical species, such as the tiger and leopard, the frontal portion being much more elevated, and the nose shorter. In the next place, the eyes, though retaining the circular contractile pupil found in the larger felidæ, are soft brown in colour, and have not the peculiarly ferocious expression so noticeable in those of the tiger. Continuing our scrutiny, we see that the limbs are comparatively slender, and though still possessing great springiness and agility are deficient in muscular power. The chief point of distinction, at the same time, consisting in the formation of the claws, which can be only partially retracted among the ligaments of the foot, and are, therefore,

constantly liable to become broken or blunted by contact with the ground; and in consequence of this, they are comparatively useless as weapons. In spite of this fact, the cheetah strikes with the paw when attacking its prey, in the same manner as the rest of the family,—natural instinct in this case appearing to prompt the animal to an act that its physical formation prevents its performing with due effect.

The cheetah is by many supposed to be unable to climb trees, an utterly erroneous impression, arrived at I should imagine without any actual observation of its habits, as the two fine specimens now in the Zoological Gardens are constantly in the habit of ascending trees placed in their den, leaping and climbing with the greatest ease and grace, and sometimes sleeping in a fork of the branches. The natural disposition of the hunting leopard appears to be especially mild and gentle, the above-mentioned pair, in the society's possession, showing great tameness, coming readily to the front of the cage when called by their names (Charley and Bessy), uttering short, self-satisfied sounds, like the purr of a magnified cat, and appearing to take great delight in being stroked and caressed by any one to whom they are accustomed. This docility of temper has been taken advantage of by the natives of India, who train the cheetah to hunt

deer and antelopes—a task for which its crafty habits and active frame are well adapted. In this sport, still a popular one with natives of rank, the cheetah is hoodwinked by a bandage covering the eyes, and is carried by his keepers in a "hackery" or cart, the antelopes being generally so well accustomed to the sight of these vehicles, which are built of bamboo, and commonly used in the country for agricultural purposes, that they will, in most cases permit the hunters to approach tolerably near before showing alarm. When the herd begin to close up together, and appear suspicious, the covering is removed from the cheetah's eyes, and as soon as he catches sight of the game he slips quietly to the ground, on the *opposite* side of the cart, in order to avoid been seen by the antelopes, and advances at a slow crouching canter, availing himself of the shelter afforded by every bush, stone, or irregularity in the ground; while endeavouring to approach in this manner, should the keen eyes of the watchful antelopes be turned upon him, the animal remains perfectly still, waiting till their attention is removed. At last, having, perhaps, approached within some twenty or thirty yards, all previous caution is thrown aside, and with a few bounds, swift as lightning, the cheetah launches himself among the terrified herd; alighting on the selected victim (generally the leading buck), and

rolling over his prey by a blow of the paw, he tears open his victim's throat, and laps the warm blood with a low growl of satisfaction. The keepers now hurry up, and after appeasing the cheetah with a portion of the antelope, go in pursuit of more game. Sometimes it happens that the hunting leopard fails to strike his prey at the first onset, in which case, after a few tremendous bounds, he desists from any further efforts, and lies down, growling sulkily. In this trait the animal resembles all the cats, which invariably secure their prey by lying in wait, or creeping stealthily up to it, and then darting forward with a sudden spring, never attempting to run it down by dint of speed and endurance, as do the dogs and wolves. With the larger animals of the race, such as the tiger, lion, jaguar, &c., the voice is a most efficient aid to them in seizing their prey: the tremendous roar uttered by the animal when springing, seeming for the moment to paralyse the quarry, and render ineffectual its efforts at escape.

The cheetah is an inhabitant both of Asia and Africa, but although those found on either continent belong to the same species, no attempt has been made to reclaim them in the latter country. In a wild state its habits are shy, its favourite haunts being wooded ravines, where shelter and water can be found, as it rarely approaches human

dwellings, and is scarcely at all dreaded for its destructive propensities. Indeed the cheetah would, moreover, seem to be by no means safe from the attacks of more powerful animals of its own kind, as Captain Rice, in his valuable work, *Tiger Shooting in India*, mentions an instance that came under his own notice, in which a cheetah was killed by a tiger, rather, as it appeared, for the gratification of some feeling of dislike than to satisfy the cravings of hunger, as the carcass was left untouched. In size the cheetah rather exceeds an ordinary leopard, though its dimensions appear greater than is really the case, on account of the length of the limbs. The colour is very similar, though the tint is rather fawn-coloured than dark yellow. The texture of the fur, besides, is by no means so smooth as that of the leopard, possessing a peculiar crispness found in no other member of the group. About the neck and chest the hair is considerably longer, giving the animal a very determined aspect, and forming a sort of mane, from which the scientific title "jubata," or maned, is derived.

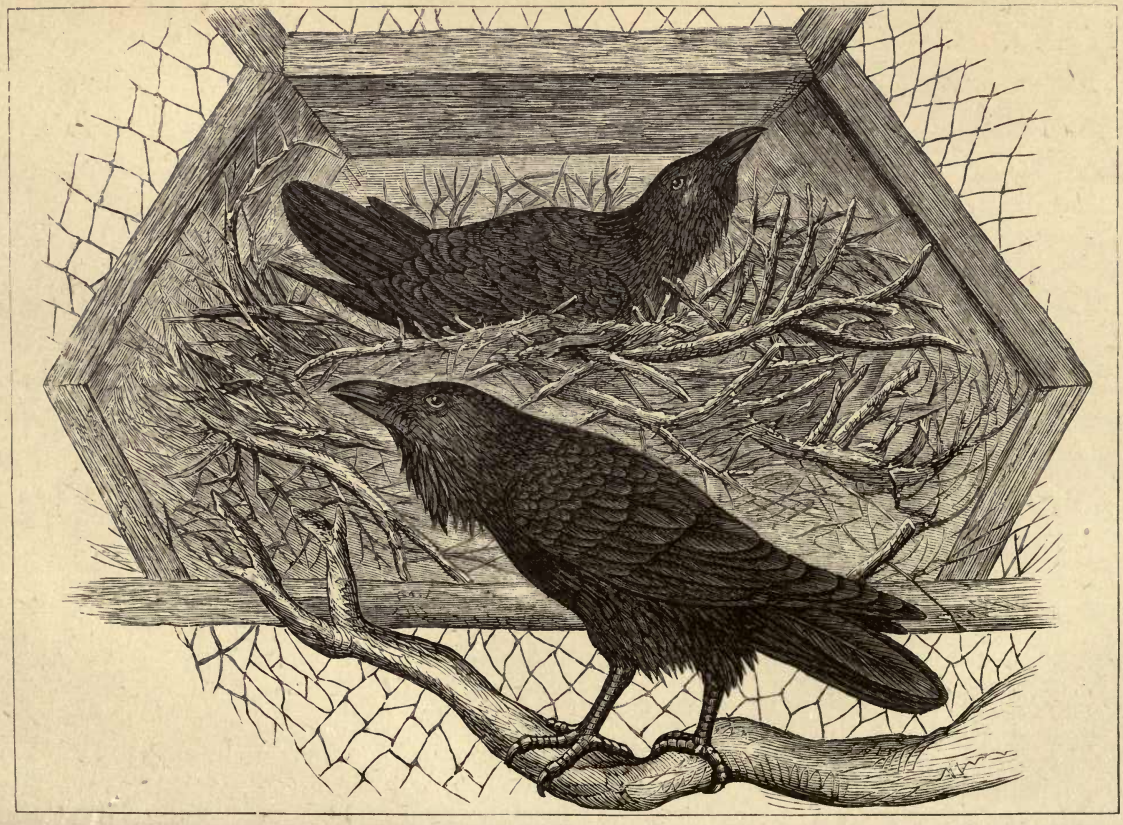
## CURIOUS SPECIMEN OF A DRIED CAT.

I HAVE lately received from Mr. Drummond, of Croydon, the dried bodies of a common cat and brown rat, in a most perfect state of preservation ; and he has most kindly placed at my disposal the following account :—"In the year 1864, two of my old houses at South End, Croydon, were pulled down. They had become ruinous and were considered dangerous. In removing the roof, there was found wedged tightly in between the rafters the body of a cat with a rat in its mouth. The skin of both appeared perfect, all the fur gone, and the bodies dried up, but displaying the muscles and prominences of bone. The attitude of the cat evidently showed that she had made a plunge into a narrow space and had succeeded in seizing the rat by its spine, but having by the spring forced her body forward, she had lost the means of withdrawing from the narrow place into which she had squeezed herself, but, retaining her grip of the rat,

both had perished by gradual starvation, and their bodies had dried into the state in which they were discovered." In consequence of the bodies being but little exposed to the air, decomposition seems to have ensued very slightly, as they are of a hard and mummy-like consistency, though without a trace of hair, excepting some of the mustachial bristles of the cat, which still remain. The larvæ of *Dermestes lardarius*, a small beetle which deposits its eggs only in dry flesh, has made considerable inroads on the interior of the bodies, little else remaining but the bones and outer skin, though the marks of the cat's canine teeth are well defined on the back of its prey. On careful examination, I find that nearly all the ribs on one side of the cat are fractured, and in several instances completely broken. Two also of the lumbar vertebræ are dislocated, as if the body of the animal had been crushed by some considerable weight. The rat appears also to have suffered from the same cause, as it is almost flattened. It appears to me, that pussy while pursuing her game amongst the rafters displaced some of the woodwork, and was killed by the closer junction of some of the beams after having secured her prey, as the rat was held in her mouth and not by the paws, the feline tribes always seizing their victims with the latter.

You uphold in all your writings so admirably the

wondrous economy of nature that I am tempted to send you for solution a question that has often puzzled me. Why is it that the cat tortures her mouse victim so sadly?—now giving it a canter, and letting it fancy it can escape; now putting it squeaking back; again allowing it a run; again shattering its hopes, and if interrupted carrying it off to renew its cruel gambols elsewhere. There must be an object in this, seeing that all cats act similarly. The only reason that suggests itself to my mind is that its flesh is rendered tenderer thereby; as we men attribute an extra superiority of flavour to the hunted hare. Or is it that nature intends it by way of caution to all other neighbouring specimens of the murine race, who may view from the corner of their holes an execution that accords with the doings of the Inquisition?



THE RAVENS' NEST AT CROYDON.

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## RAVENS NESTING IN CONFINEMENT.

The pair of ravens represented in the accompanying sketch were for some time in the Zoological Gardens before coming into my possession. There were other specimens there at the time, and Mr. Bartlett, who kindly procured them for me, considered that they might be induced to nest if placed in an aviary where they would not be liable to disturbance. Early in January, 1871, they began to form a nest, the male commencing the work by carrying up sticks and branches, which had been placed for their use, to a nesting-box fixed in one of the upper corners of their place of confinement. Of these materials he soon constructed a sort of platform to serve as the basis of the structure. This was soon interwoven with smaller sticks and fragments of roots, until it assumed a somewhat cup-like form. The female now aided her mate by sitting in the concavity, and weaving in the building materials carried up to her by the male. They soon

finished the exterior framework, and then commenced lining the interior with straw, grass stems, feathers, and wool, which were supplied them in abundance, the male in all cases carrying up the materials, and the female working them into the fabric. When completed about the end of January, the nest resembled that of a rook in shape and general appearance, though much larger, and more warmly lined inside.

The female at this period frequently remained for a considerable time in the nest, and, I believe, would have deposited and hatched her eggs, had not her death suddenly taken place. On dissection I found the cause of death to proceed from a diseased ovary. She had always appeared in perfect health previously, and I greatly regretted the circumstance of her death, as, to the best of my belief, no instance has been yet known of the raven hatching and rearing its young in confinement.

The raven, though formerly common, is now becoming extremely rare in England, principally on account of the relentless way in which nearly every pair is destroyed by gamekeepers. In reality this bird is far less destructive to the eggs and young of game than is usually imagined, its most common food consisting of field mice, worms, small reptiles, and any kind of carrion ; the raven, in fact, is a scavenger, not a poacher ; and though it might

occasionally kill a young rabbit or leveret, I am convinced that stoats, weasels, and more especially the common brown rat, commit infinitely more havoc among game of all kinds than any of our native birds of prey, with perhaps the exception of the peregrine falcon in localities where there are large tracts of moorland devoted to the preservation of grouse, and where there is comparatively little cover for the game.

In a wild state the raven builds its nest in the most inaccessible situations, generally on the faces of high precipitous cliffs, and occasionally in lofty trees.

A most interesting account of the nesting habits of a pair of ravens is narrated by Mr. Knox, in his work, *Ornithology of Sussex*. Petworth Park, in that county, was the locality selected by the birds. Professor Newton, in Hewitson's *Eggs of British Birds*, also describes the nesting habits of the raven in England. In this case the nest was built in one of some tall Scotch fir-trees standing by themselves on an extensive heath in the vicinity of Elveden, Suffolk. He mentions that when undisturbed the old pair usually refurnished their last year's nest, lining it with rabbit's down. The number of eggs was commonly five, but sometimes four; and on one occasion six were deposited. During the period of incubation, the male was

accustomed to perch on one of the highest boughs, and attack immediately any approaching bird that he considered likely to molest the eggs or young ones.

In the Sogne Fjord, in Norway, near Gudvangen, I have seen the nest of a raven placed on a small ledge projecting from the face of a precipitous cliff, rising nearly 3,000 feet perpendicularly from the surface of the water. The young birds had been fledged some time, but both old and young remained in the vicinity of the nest.

On assuming their first plumage, the young ravens are of a uniform dull black, without any of the resplendent steel blue gloss of the old birds; the gular feathers also have not assumed the peculiar lanceolate form noticeable in the adult specimens. The full plumage, however, is assumed after the first moult, which takes place in the autumn of the same year the young have been hatched.

The family usually remain together during the summer and early part of the autumn, the young birds leaving their parents on the completion of the first moult.

While deer-stalking on the Norwegian mountains, I have several times had my sport spoiled by ravens. No wild animal is more wary in its habits than the reindeer, and when a herd is lying down at rest during the middle of the day, the whistle of the

golden plover, the screech of the red-throated diver (a common bird on the mountain lakes), or the croak of the raven, will immediately cause them to start off at speed, nor will they stop till they have gone a considerable distance from the fancied danger they have been warned of by the birds.

On one occasion I had marked down a fine stag with two hinds in ground well adapted for a successful stalk, and having the wind in my favour, and plenty of cover in the shape of large gneiss boulders, was rapidly approaching within shot, when I heard the harsh alarm croak of a raven above me, and saw the stag and hinds, on hearing the sound, start up hurriedly, and bound off at their utmost speed, convinced of the existence of some approaching enemy by the call-note of their feathered ally, though otherwise totally unaware of my presence.

# ON THE FORM AND STRUCTURE OF DINORNIS GIGANTEUS.

About twenty-one years ago, a small piece of bone that had arrived among a consignment of fossils sent from New Zealand to the Museum of the College of Surgeons, baffled several of the leading geologists of that day by the remarkable peculiarities of its structure. Though equal in circumference to the thigh bone of a horse, it possessed that singular cellular formation found only in birds. On this account it could clearly have belonged to no quadruped; the question was, to what unknown form must they then refer it? After remaining some time in doubt, the relic was handed over to Professor Owen, in the hope that he would solve the mystery. After a long and careful examination, be concluded at last, from diligent comparison with other bones, that it must have belonged to a bird partaking in a great degree of the ostrich's generic character, but of far greater

size, measuring no less than fourteen feet in altitude, and not using its wings as organs of flight. When this statement, based on such apparently slight grounds, first appeared in print, it was scouted as ridiculous, no one believing that such a monster had ever existed. However, some time afterwards, among another collection that arrived at the museum, many bones and remains of the Dinornis, as it was named, were found. From these a skeleton, perfect with the exception of the skull, was formed, under the superintendence of Professor Owen, which fully confirmed the truth of his theory, and proved beyond doubt the form and structure of this mightiest of the feathered creation. Since then many remains have been sent over, and four genera, Dinornis, Palapteryx, Nestor, and Notornis, have been established, the last named being a large bird allied to the rails and coots. Of the genus Dinornis, five species have been discovered, of which the smallest was nearly similar in dimensions to the Kivi or Apteryx, and the largest, D. giganteus, attained the colossal height of fifteen feet!

Some idea of this enormous bulk may be formed from the fact, that a full-grown ostrich very rarely measures more than eight feet, counting from the ground to the top of the head. In form, it must have approached the cassowary rather than the ostrich, the legs being shorter in proportion to the

body, and the whole frame heavier and more massive. These particulars I have been enabled to gather from the specimens at the College of Surgeons, and from the information kindly afforded me by Professor Owen and Mr. Buckland. The most interesting point in the history of this bird is, however, in the probability of its existence at the present time. Many of the bones brought to this country were comparatively fresh, and had evidently lain in the earth for no long space of time. Moreover, tales are heard from the natives concerning a huge bird, called by them "Moa," said to exist still in the mountain ranges of the interior. It is described as being nocturnal in its habits, and feeding on the roots of the ferns that grow so abundantly along the wooded gullies. Now a few observations on the localities in which the bones have been found may tend to throw some light on the subject. In the first place, none of these remains have been found on dry land, but all are from the banks and beds of fresh-water rivers, buried only a little distance in the mud; and it must also be borne in mind that these streams flow from hills of considerable height. Besides, the bird is known perfectly to the inhabitants, many of whom declare they have seen it, and none of the bones seem to have been brought into their present situation by the action of any violent rush of water. We may

therefore fairly imagine that from its nocturnal and solitary habits, the Moa is likely still to exist in limited numbers in the more secluded parts of the island, not yet visited by Europeans. Additional reason for supposing these noble birds to exist is found in the fact that specimens of their eggs have been preserved. In the volcanic sand of Cloudy Bay Mr. W. Mantell found a gigantic egg, which we may reasonably infer to be that of either Dinornis or Palapteryx, of which he gives us a familiar idea by saying that his hat would have been but just large enough to serve as an egg-cup for it. But about the same time as Mr. Mantell's discovery, one of equal interest was made in Madagascar. The master of a French ship obtained, in 1850, from natives of the island, two eggs of far greater size, and fragments of the tibiæ of an immense bird. The native statement was that one of the eggs had been found entire in the bed of a torrent, among the debris of a landslip; and that a second egg, with some fragments of bone, was subsequently discovered in an alluvial formation. These two arrived in Europe entire, and formed the subjects of valuable investigations by Professors Owen and Geoffrey St. Hilaire. The two, though nearly alike in size, differed considerably in their relative proportions and shape, the one being shorter and thicker, with more equal ends, than the other. The

following table shows the dimensions of both compared with those of an ostrich's egg :—

| | Ovoid egg. | | | Elliposod egg. | | | Ostrich egg. | | |
|---|---|---|---|---|---|---|---|---|---|
| | ft. | in. | li. | ft. | in. | li. | ft. | in. | li. |
| Longer circum. | 2 | 10 | 9 | 2 | 9 | 6 | 1 | 6 | 0 |
| Shorter „ | 2 | 4 | 3 | 2 | 5 | 6 | 1 | 4 | 6 |
| Extreme length | 1 | 0 | 8 | 1 | 0 | 5 | 0 | 6 | 4 |

The fragments of bone indicated a bird of the same natural affinities as the New Zealand colossi and of dimensions not widely remote from theirs. Professor Owen thinks that it did not exceed in height or size Dinornis giganteus, and there is a probability that it was slightly smaller. The Madagascar bird has been named Œpiornis maximus. The willing fancy suggests the possibility that in an island of such extent as Madagascar,—possessing lofty mountain ranges, covered with the most magnificent forests, where civilised man has only yet touched one or two spots on the seaward borders, but where those slight explorations have educed so many wondrous animals, so many strange forms of vegetable life—the noble Œpiornis may yet be stalking with giant strides along the fern-fringed hill sides or through the steaming thickets ; while in the more contracted area of New Zealand the Moa still maintains a precarious footing, almost

unknown to man by reason of its nocturnal habits, till the searching glance of modern science shall point out its character and habits, demonstrating clearly the present existence of this giant of the feathered tribes.

## BRITISH SHREW-MICE.

THESE curious little animals are regarded by some persons as being actually mice, on account of their somewhat mouse-like form, though they belong in reality to the insectivorous order, which in Britain comprehends the shrews, the hedgehog, and the mole, and has not the slightest affinity to any of the rodent types. The genus *Sorex* is characterised by having the ears and eyes small, the snout singularly elongated, and tapering to a point; the tail long, slender, and somewhat quadrangular in form; the feet short, with five toes, the claws being compressed and acute. The dentition consists of two incisors in each jaw; the upper ones are curved and notched at the base; the lower ones are elongated and almost horizontal, the upper edge being serrated in some species, these are followed by three, four, or five præmolars on each side above, and two below. These teeth have been regarded as lateral incisors by some zoologists. The true molars are four on

each side above, and three below. The shrews are all plantigrade, and possess clavicles.

The common shrew (*Sorex araneus* of most authors) is extremely common in most parts of England, frequenting hedges and moist pastures, and feeding on worms, the larvæ of insects, and young frogs and lizards. In procuring the former, its long, flexible snout is of great service for burrowing and rooting in the loose soil. This species breeds in the spring and summer, producing two litters of from four to seven each. There is generally, from some hitherto unexplained cause, a periodical mortality among these little animals in August or the beginning of September, at which period numbers are found dead along pathways and the sides of roads, in most cases displaying no external injury. Many hypotheses have been started to account for this sudden death of so many, the real reason being, in my opinion, the want of water. It is well known that the insectivora are more impatient of hunger and thirst than any other class of mammalia, dying if deprived of food and water for four or five hours. I believe, therefore, that this annual mortality must principally be referred to this cause, as during a wet season few, if any, dead shrews are to be found, and in many specimens I have dissected at this period I could find no trace of external or internal injury.

The male shrews are, as is also the case with the mole, much more numerous than the females, and in the spring they seldom meet without fighting. Besides this species, another kind, the chestnut shrew (*Sorex castaneus*), is described by Mr. Jenyns. I believe it merely to be the common shrew in its summer fur, which at that period is light reddish brown, varying in shades in different individuals. Its winter and spring coat is longer and thicker, and is dark brown above and grey beneath. In many specimens the tints vary, and I am inclined to think that both the so-called *Sorex castaneus* and *hibernicus* to be merely specimens deviating slightly from the ordinary tint.

Two species of shrew have been discovered in a mummied state in the catacombs of Thebes and Memphis. Of these, one is the *Sorex giganteus* of Isidore Geoffroy; the other is a small species, termed *Sorex religiosus* by the same author. Of this species several well-preserved specimens existed in M. Passalaqua's collection of Egyptian antiquities in Paris. A shrew, probably this species, was especially held sacred in districts of ancient Egypt.

# ON THE HABITS OF THE WATER-SHREW.

## (*Crossopus fodiens.*)

[*Read before the Zoological Society, June 27th*, 1865.]

I AM induced to offer you the following account of the water-shrew, as the animal in question, though tolerably abundant in many localities, may not have come under the personal observation of some of my hearers. I have also never seen it mentioned as having been kept with success in confinement, and therefore will attempt to describe as accurately as possible the habits of a pair that lived in my possession for a considerable time, hoping that the details may not prove altogether uninteresting.

In form this shrew closely resembles the common species, the snout being lengthened in the same manner, and the fur having the same velvety softness of texture. In size, however, it is superior, a full-grown male measuring a little more than five inches in total length, whereas the field-shrew rarely exceeds four inches; the feet and tail are

fringed with stiff white hairs, which are of great assistance to the creature when swimming. The colour on the head and back is commonly of a rich jetty black, on the sides and underparts pure white ; the line of demarcation between the two colours very distinctly defined, adding much to the beauty of the fur; a small tuft of white hairs is also noticeable at the corner of the ear.

The water-shrew, as its name implies, is usually found in the vicinity of pools and rivulets, where it forms in the banks long and winding burrows, which penetrate for a considerable distance into the loose soil, and end in a small chamber, furnished with a bed of moss and dry grass. In this secluded retreat the young are produced about the middle of May, there being usually from six to ten in the litter. When first born, they are curious pinky-white little animals, with round blunt noses and semitransparent bodies, bearing as little resemblance as possible to their parents, A small colony of these shrews frequently inhabit the same spot, and towards the cool of the evening may be observed searching for food, and sporting with each other in the water, now hiding behind stones or large leaves to elude their companions, and then darting out to engage in a general skirmishing chase, diving and swimming with the greatest activity, and occasionally taking a plunge into their holes. By constantly traversing

the same ground, in going and returning from their burrows, they gradually tread down a path among the grass and herbage, by which their presence may readily be discovered by an experienced eye. When under water their fur is covered with multitudes of tiny air-bubbles, that shine like silver, and have a beautiful effect when seen against the dark surface of the body. Spots where the stream in some bend of its course forms a little pool are the favourite resorts of this pretty little creature; and, although easily startled by the slightest noise, their range of vision seems far from extensive, as, by quietly approaching, I have often succeeded in watching their gambols without causing alarm among the small community. The food of the water-shrew includes insects, worms, young frogs, and small fish, which latter it pursues and captures with all the graceful dexterity of the otter. I am enabled to speak with certainty as to this fact, by observing the mode employed by my own pets in seizing their prey. I obtained them in the following manner:— Having noticed a very fine pair that frequented a small pond, I set several circular wire mouse-traps, baited with small frogs, in what I supposed to be their favourite runs, and secured both male and female by the next morning. I had already had a cage constructed as much as possible in accordance with what I knew of their mode of life. It was

shaped like an ordinary arched dormouse-cage, but considerably larger than those used, being twelve inches in height by eighteen in length ; a zinc tank was also adapted to hook on to the doorway, so that they might enjoy the comfort of a bath. When first introduced into their new dwelling, the shrews evinced no symptoms of fear, appearing quite at home, and feeding freely on worms, raw meat, and insects. A few days after I procured them I placed three or four minnows in the bath attached to the main part of the cage. Directly the shrews caught sight of the fish, they both plunged instantly into the water, and quickly reappeared, each having secured a victim, which they proceeded to discuss with great apparent gusto, having first killed it by a bite through the head. I remarked that while feeding they held the fish firmly between their fore paws, in the same manner as the otter, and, commencing at the head, ate gradually downwards, by a succession of sharp snapping bites. Their appetites were very good, as they frequently consumed two or three minnows each in one day—a very tolerable amount, considering their size. When running about their cage, these shrews often uttered a shrill sibilant chirip, resembling the note of the grasshopper-lark. They would also play in the water, half rearing up and striking with their fore paws or rolling over and over each other on the surface.

Though appearing perfectly reconciled to captivity, they manifested no attachment, nor especial tameness, biting viciously when touched. They lived with me in this way several months in perfect health, till, the cage-door being accidentally left open one day in my absence, the inmates levanted, as a matter of course, and were never seen or heard of afterwards. I hope, however, shortly to obtain more, as, when treated properly, and supplied with plenty of water, they thrive, and might probably be induced to breed in confinement.

## THE OARED-SHREW.

BESIDES the common shrew, which is exclusively terrestrial, another species, the oared-shrew (*Crossopus remifer*), is found in Britain. For some time this animal was confounded with the water-shrew, as its habits are similar, and it frequents the same situations. It differs, however, in colour, the black on the back and sides being flecked with white hairs, the throat and abdomen blackish grey tinged with yellow. Though scarcer than the two other kinds, the oared-shrew is more abundant than is often supposed by naturalists, as I have several times caught it in different parts of Hertfordshire and Surrey. I must here remark that the ears of both the oared and water-shrew are furnished with a peculiar and beautifully contrived apparatus by which the water is excluded from those organs. It consists of three small valves, which fold together when the animal dives, effectually preventing the entrance of a single drop of moisture. As soon, however, as the pressure

is removed, on the shrew rising to the surface, they reopen spontaneously. Without this provision of nature, the animal would constantly be annoyed by the water filling the cavities and irritating the delicate membranes of the ear.

The dimensions of full-grown individuals of the three species are as follows :—

COMMON SHREW.

| | in. | lines. |
|---|---|---|
| Total length ... ... ... | 4 | 1 |
| Head ... ... ... ... | 1 | 2 |
| Tail ... ... ... ... | 1 | 9 |
| Hind foot ... ... ... ... | 0 | 3 |

WATER-SHREW.

| | | |
|---|---|---|
| Total length ... ... ... | 5 | 7 |
| Head ... ... ... ... | 1 | 5 |
| Tail ... ... ... ... | 2 | 1 |
| Hind foot ... ... ... ... | 0 | 5 |

OARED-SHREW.

| | | |
|---|---|---|
| Total length ... ... ... | 6 | 1 |
| Head ... ... ... ... | 1 | 7 |
| Tail ... ... ... ... | 2 | 4 |
| Hind foot ... ... ... ... | 0 | 7 |

## WATER-SHREWS KILLING YOUNG FISH.

I AM sorry to say that the charge of killing young fish stated against that pretty little animal, the water-shrew, is a true one. A pair I kept in confinement some time ago always preferred living minnows and sticklebacks to other food, and would pursue and capture them with all the grace and dexterity of the otter, when placed in the tank of water attached to their cage. I mentioned this fact particularly in a paper I read before the Zoological Society. I have, moreover, seen both the common water-shrew and the oared-shrew (*Crossopus remifer*), when I have been watching by the banks of a stream frequented by them, often plunge into the water and bring out small fish, newts, and insects. Though the shrew is undoubtedly a fish-eater, there is another side of the question which it will be but fair to consider. The larvæ of dytiscidæ and dragon-flies are also favourite articles of food with these little quadrupeds, and as these are well known to be

most deadly foes to the newly-hatched salmon and trout, possibly the mischief done by the shrews may be to some extent counterbalanced by the good they do in killing these enemies of the young fish. The best way of catching the water-shrew is by placing a circular wire mouse-trap, baited with a fish or young frog close to the runs they make by the water's edge. Generally, a small community of ten or twelve inhabit the same pool or rivulet, and it is a most interesting sight to watch them gambolling with each other or searching for food. Though generally living on peaceable terms, the males fight desperately during the spring, generally continuing the contest till one or other of the combatants is killed. I should scarcely think that the shrews could destroy all the young trout lost by your correspondent in a single night, and agree with Mr. Buckland in attributing at least part of the damage to the rats. Digestion goes on very rapidly in all the insectivora, and the delicate bones of young fry would be more rapidly absorbed than the harder wing cases of insects. I have also dissected both species of water-shrew myself, with remains of fish in the stomach and intestines, and will send the next culprit I detect in the act of fish-eating to Mr. Buckland for examination.

## BRITISH ARVICOLÆ, OR VOLES.

### THE WATER-RAT.

THREE tolerably distinct species of these little animals have, for some time past, been known to naturalists; but the actual specific distinctions between the kinds, and the variations in the colour of the fur they assume in various localities, have never yet been clearly and accurately determined. The voles are small rodent quadrupeds, nearly allied to the true *Muridæ*, but differing from them in having the head larger and rounder in proportion to their size, the ears being almost hidden in the fur, the tail being also shorter, and in the aquatic species slightly flattened at the sides. Of our British species the water-vole (*Arvicola amphibia*), commonly known as the water-rat, is the largest, equalling the common brown rat (*Mus decumanus*) in size.

The fur is reddish-brown above, shading into pinkish-white beneath, and consists of a soft woolly undercoat, well fitted to resist the water, in which

the creature is so frequently immersed, mingled with long shining hair, which gives a peculiarly glossy appearance to the back and sides. The incisor teeth are very large and strong, and are covered externally with a layer of hard yellow enamel. Though so thoroughly aquatic an animal in its habits, I am convinced that the water-vole is often killed in considerable numbers by colonies of the house-rat, which, in the summer months, migrate from the farm buildings and yards to the banks of streams and ponds, committing great havoc among the younger fish and water-fowl, the blame of which devastation is generally placed to the credit of the poor vegetarian vole.

As I have mentioned before, the common rat is as much at home by the water-side as the vole, and I have seen one of the latter pursued by a rat in the water, and vainly endeavouring to rid itself of its enemy by continued diving. The water-vole usually selects river-banks or the neighbourhood of large ponds, where its favourite food, the *Equisetum*, or "mare's tail," grows. In these situations it forms long and winding burrows, which invariably have one outlet above the water and another beneath the surface, so that, in case of danger, it has more than one opportunity for escape. It never enters houses or barns, and shuns the vicinity of man, being a peculiarly shy animal. Its habits, however, are

easily watched, and I have frequently observed them on fine balmy evenings in the summer, when the warm breeze gently rustled the waving sedges and water-flags, and bright-coloured dragon-flies hawked on gauze-like wings over the glassy pool in quest of aquatic insects that were emerging from their pupa state towards sunset, when the moor-hen swam out in security from the tuft of reeds which had concealed her during the hotter hours of the day, followed by her brood, tiny black balls of down, that chased each other in their play, forming little glistening circlets of silvery light on the water. At these times I have seen the water-voles engaged in foraging for food on the banks, or swimming leisurely about, taking an occasional nibble at some tempting stem, and then diving suddenly and reappearing almost immediately in the same place.

The water-vole, as far as I have observed, never hybernates during the winter months, but remains perfectly lively, laying up, however, a store of food in its burrow, in anticipation of the inclement season it evidently knows is approaching.

Besides the common brown kind there is a black variety, found in some parts of England, especially in Hertfordshire and Essex. This has caused considerable difference of opinion as to whether it is a mere local variety, or possesses sufficient claims to be considered a distinct species. I have very carefully

examined several black and brown specimens taken in various localities, and will proceed to point out what I consider to be the actual distinction between them.

In the first place, the black kind is considerably the smaller of the two, a full-grown specimen of the common sort averaging thirteen inches in total length, whereas the other rarely exceeds nine; secondly, the tail is, in all cases that have come under my personal notice, considerably longer in the black vole. The head is also smaller, and the eyes smaller in proportion to the size of the animal. On dissection, the only distinction I could find was that the principal intestine was considerably larger, when extended, in the black specimens. There was no difference in dentition, but the form of the skull was proportionately more lengthened in the black than in the brown individuals. I have seen young specimens of both varieties, but have never met with a black specimen inhabiting the same burrows with the brown ones, but always appearing to form a small colony of their own. Indeed, I believe that several species of our smaller mammalia are confounded together or imperfectly known, especially among the bats, shrews, and rodents.

The second species that comes under our notice is the field-vole (*Arvicola campestris*). This species is considerably smaller than the water-vole, seldom

exceeding six or seven inches in length. In colour it is light greyish brown above, shading into bluish grey below, and has a tuft of thick hair growing on each side of the jaw, which gives it a peculiarly bluff appearance. It frequents damp pastures and low-lying fields, scarcely if ever being found in hilly localities, its place there being taken by its congener the bank-vole (*Arvicola riparia*). It seems to be more prolific than the water-vole, generally proing three or four litters in the season, while the others generally only have three or four young ones about the beginning of May. They are also much more destructive in their habits, often peeling the bark from young trees for food, and thus committing considerable damage.

Some years ago a great number of young holly trees were destroyed in the New Forest and in Dean Forest by the voles, the bark being entirely eaten off for a distance of several inches from the ground. Great numbers of young oaks and chestnuts were also found dead, and on being taken up it was found that the roots had been gnawed through below the surface of the ground. The most effectual method of dispersing these marauders, it was found, was digging a great number of holes in the ground about two feet long, eighteen inches wide, and eighteen inches deep at the bottom ; at the top they were only eighteen inches long and

nine inches wide, so that when the animals fell into them they were unable to escape. More than 40,000 field-voles were taken in those holes in the space of three months, irrespective of those that were taken out of the holes by the stoats, weasels, crows, and magpies that had assembled in great numbers to assist in extirpating the little marauders. I have kept both these species and the bank-vole in confinement, and found that they rapidly became tame, allowing themselves to be freely handled, and would frequently take grains of corn from my fingers, though they would resent any liberty from a stranger with a tolerably severe bite. They are perfectly devoid of any unpleasant smell, and make interesting little pets.

### THE BANK-VOLE.

The third species is the above-mentioned bank-vole. This species is rather smaller than the field-vole, and differs from that animal in having the tail rather longer, and the fur of a bright reddish-brown above, shading into yellowish white beneath. It frequents drier situations than the other species, being found principally in the banks of old hedge-rows and among heaps of stones. It is a very active little animal, and moves with great agility. Its habits are identical with those of the last-mentioned species.

## THE WATER-VOLE AND FISH.

A TRUE water-vole, will do no harm to fish, as this animal feeds almost exclusively on vegetable substances, although he will gnaw bones. I can safely say that he will not touch fish, as I have tried a tame specimen with both dead and living fish, minnows and small gudgeon, and he takes no notice of them. The common brown rat, however, frequently migrates to the waterside during the summer, and is a most destructive enemy to fish. I remember once while ferreting rats, by the banks of a small brook, finding no less than fourteen gudgeon stored away in a burrow, from the interior of which soon afterwards bolted an old rat with several well-grown young ones. The common rat is also a determined enemy to the water-vole, and takes every opportunity of attacking it, as it is as much at home in the water as its antagonist. The poor voles generally get the worst of it in these conflicts, as it is by no means a fighting animal, and commonly lives a happy and contented life by the banks of reedy streams and pools, where plenty of shelter is to be obtained.

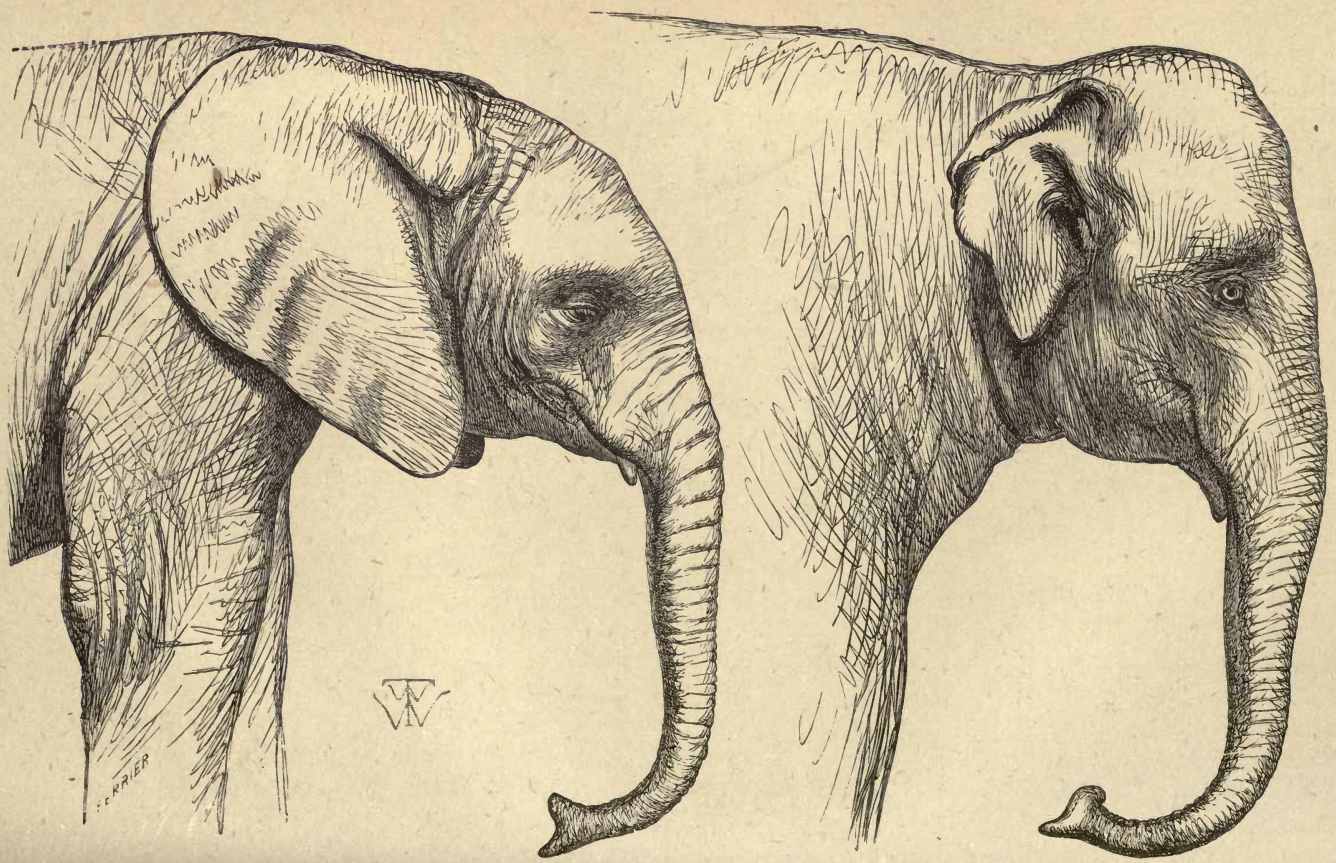
## GNAWED CARIBOO HORNS.

I SHOULD think it extremely likely that the cariboo horns, mentioned by your correspondent, "Wanderer," in LAND AND WATER, were gnawed by musk rats, or by some rodent, having an affinity to our British water-vole (*Arvicola amphibia*), as in many of the caverns containing fossil remains of mammalia marks of teeth are found on the bones, which I was kindly informed by Mr. Busk, were in many cases those of the vole. I have also myself tried the experiment of placing bones in the vicinity of a stream frequented by water-voles, and found that they often gnawed them, though generally considered by naturalists of the present day to be exclusively vegetarian in diet. I took particular care, however, to ascertain, in this case, that the voles, and not the brown rats, gnawed the bones, and have seen them myself in the act. I should also think it unlikely that hares gnawed deer horns, and that, on examination, the tooth marks will be found to be those of the musk-rat. If such be the case, it will prove an interesting similarity in habits between that animal and the water-vole.

## THE AFRICAN ELEPHANT.

Two species of Elephant have long been known to inhabit the great continents of Asia and Africa. They differ from each other in several particulars, of which the size of the ear is most conspicuous. (See engraving.) Though well known to the ancients, the peculiarity of the large ear in the African elephant, Fig. 1, does not seem to have been much noticed of late years, for in some works on natural history the ears of the African elephant are represented scarcely one-third of their natural dimensions. The tusks, moreover, are, as hunters know, much larger in proportion than those of the Indian congener, Fig. 2, and are found in *both* sexes.

In the African elephant, the tusks sometimes reach a great size, as for instance a specimen which weighed 140 pounds, measured eight feet in height, and twenty-one inches in circumference. The comparisons between the two species of elephant



TWO ELEPHANTS' HEADS.

*To face page* 105.

can now be made with facility, since the arrival of two young animals in the Zoological Gardens. Of these, the male was sent over last July, and the female some weeks later,—the first living African elephants ever received in this country. On a first view of them the spectator will be struck by the outline of the head of the African elephant (see engraving Fig. 1), which is much more convex in shape than that of the Asiatic animal. The lower jaw is less deep and massive, and the ridge of the back higher. Another notable difference consists in the peculiar form of the grasping organ at the extremity of the trunk, which in the African animal consist of two prehensive lips, opposable to each other, and which act in much the same manner as the human thumb and fore-finger, forming a much more efficient instrument than that of the Asiatic elephant, which possesses only one appendage at the end of the proboscis, which requires to be bent over, when in use, to meet the lower surface.

The young male at the Gardens has become a very popular character since his arrival. He is on the best of terms with the two Indian elephants in the society's possession, frequently bathing with them during the hot weather, and being especially friendly with the young Indian male, of about his own age and size. The difference between the two species is most obvious when seen side by side.

When loose in their paddock, both elephants are in the habit of raising their enormous ears, which then have the appearance of two huge bat-like wings, projecting from the sides of the head (see engraving), that flap up and down as the animal moves, giving the creature a most unearthly aspect. In fact, an African elephant would certainly create a sensation if introduced into the incantation scene in *Der Freischütz*. The dimensions of the male, which I have been enabled to take by the kind permission of Mr. Bartlett, are as follows:—Perpendicular diameter of ear, 2 ft. 8 in.; horizontal diameter of ear, 2 ft.; length from forehead to insertion of tail, 6 ft.; length of trunk, 3 ft. 6 in.; length of tail, 2 ft. 3 in.; height at shoulder, 5 ft. 1 in.; height at ridge of back, 5 ft. 6 in.; circumference of fore-foot, 2 ft. 8 in.; circumference of hind-foot, 2 ft. 8in.

He is at present between five and six years old, and will most probably prove a very large animal. The African species considerably exceeds the Asiatic in size; a full-grown male of the former not unfrequently measures more than twelve feet in height at the shoulder, while ten is greatly above the average of the latter. The elephants seen by Dr. Livingstone on the Limpopo were of great size, but the dimensions appear to vary in different districts; those found on the Zambesi being smaller than

those further south, though the tusks appear to be heavier in proportion. Of the ivory sent to Quillimane, from whence an enormous quantity is exported, some is from mountainous and rocky country; this is heavier in proportion to its apparent size, and harder in texture than that from the plains.

Though gregarious in their habits, the male and female elephants go in separate herds, never being seen to associate with each other. The food of the African elephant principally consists of leaves and bark of trees, of palms, and all kinds of sweet fruits found in its haunts, but very seldom of grass; the "spek boom," is also a favourite article of food.

Few finer sights can be seen by the lover of nature than a herd of elephants in their wild state. Picture to yourself an expanse of park-like country, dotted with clumps of mimosas, loaded with sweet-scented yellow flowers, and with clumps of thorny bushes and high yellow reeds, alternating with savannahs and open glades clothed with luxuriant grass and herbage, while here and there a large "Kameeldoorn" tree, or Baobab, towers over all surrounding objects. Scattered over the landscape are seen a herd of some thirty noble elephants, some standing at rest beneath the shade of the trees, fanning themselves with green branches, blowing clouds of dust over their lofty backs, and

continually flapping their huge ears. Others are feeding on the mimosa twigs, or scooping the sun-hardened soil from around some succulent bulb, while, perhaps, one enormous male, the patriarch of the herd, is labouring with his powerful tusks to overturn some tree in order to feed on the tender shoots that are now beyond his reach. Using each of his tusks alternately, he ploughs up the soil, detaching the root-fibres until he has loosened it sufficiently, when, with one tremendous pull of his twisted proboscis, down comes the tree with crashing boughs and upturned roots, raising a cloud of earth and dust. The rest of the herd crowd round their industrious leader, and regale themselves on the succulent tendrils.

I have never heard of an instance of albinism in the African elephant; a circumstance which, although extremely rare, occurs sometimes among the Asiatic species. The colour in this variety is of a brownish-cream colour, giving an unhealthy and by no means favourable appearance to the animal.

The molar teeth of the Asiatic and African elephant differ from each other in the arrangement of the enamel; that on the surface of the grinders of the former being moulded into a number of flattened ovals, placed transversely; while in the latter it takes the form of five or six lozenge-shaped folds. The growth of the molar teeth takes place

in a very curious manner in both kinds of elephants, more than a portion of the two in use never projecting from the gum at the same time, the remainder being hidden in the jaw, and moving forward as the exposed portion is worn away by mastication. When the anterior tooth is thus worn out, absorption of its fangs and sockets ensues, while the posterior molar takes its place, its position being in time occupied by a third, which undergoes the same process, and so on for at least seven times. An elephant's molar tooth, therefore, is never to be seen in a perfect state.

Mr. Corse, speaking of the Asiatic elephant, states that the first, or milk-tusks (corresponding to the incisor teeth), never grow to any size, but are shed between the first and second year; the time at which the tusk cuts the gum seems to vary in different individuals. He also mentions a young male which cut his tusks when about five months old, while those of another did not appear till he was seven months old. He gives the following examples of the progress of this part of the dentition: "A young elephant shed one of his milk-tusks when nearly thirteen months old, and the other about three weeks later; they were merely two blackish stumps when shed, but two months afterwards the permanent tusks cut the gum, being at first black and ragged at the ends. When,

however, they projected beyond the lip, they were soon worn smooth by the motion and friction of the trunk. Another young elephant did not shed his milk-tusks till he was sixteen months old."

It will be interesting to watch the development of the tusks in the young female African elephant now in the Gardens, as her permanent tusks have not yet begun to appear, whereas in the male, her companion, they project considerably.

# THE OYSTER.

In commencing this subject I first propose to divide the account I have attempted to give of this familiar and generally popular bivalve into four sections. In the first I shall endeavour to describe the different varieties of the oyster that are at present principally cultivated in Great Britain and France. Secondly, the nature of the young oyster, or spat, as it is technically called, and the conditions favourable or unfavourable for its development. Thirdly, the cultivation of the oyster, and the treatment under which it has thriven most successfully. And in conclusion, I shall endeavour to call attention to some of the natural enemies of the oyster, and the best mode of extirpating them from the oyster-beds. I cannot lay claim to having had much experience in this most interesting subject, but having acquired much interesting information, both from my own observation and from the accurate knowledge of my valued friend,

Mr. Frank Buckland, when assisting him in his management of the Herne Bay Oyster Fishery during the past summer, I shall endeavour to describe some of the most peculiar features in the artificial culture of these molluscs, which are as much improved in size and flavour by proper care and attention as any of our present breeds of sheep or oxen. With reference to the principal varieties of the oyster, the Whitstable for the last twenty years has generally been considered as possessing the most delicate flesh, combined with the thinnest and smallest shell of any of our British varieties. The Swansea, Colchester, and Faversham oysters are also considered of excellent quality, but their chief fault is, that they vary very much in different seasons, the produce of one year possibly being equal to the best Whitstable or Isle de Ré oyster, while the crop in the next may be vastly inferior in every way. The beds in Galway Bay would naturally produce an extremely good kind, but as they have remained in a dreadfully neglected state under bad management for several years, the oysters have sadly deteriorated in both number and quality. The large Channel oyster, the sort generally sold at stalls in the streets, is an almost worthless variety, possessing great thickness of shell, with but a small amount of tasteless and insipid flesh.

I now come to a rather important variety, namely,

green oysters. Oysters are grown to sell, and English people will not eat oysters which have green beards, on the ground that they are impregnated with copper and are consequently poisonous. Foreigners on the contrary delight in green-bearded oysters. The green oysters in England are of two kinds, those from Falmouth, and the green oysters which are found in the river Roach on the coast of Essex. I propose to describe the latter first. The river Crouch runs into the river Roach, and though the oysters in the Crouch are white-bearded, those in the Roach are almost invariably green; this green colour, however, does not extend to the whole meat of the oyster, but to the fin or beard only. Mr. Buckland and Mr. Wiseman, the proprietor of large oyster-grounds at Paglesham in Essex, have taken considerable trouble to find out the cause of their peculiar appearance. The facts are as follows:—

The Roach oysters begin to assume a *green beard* in the months of September and October, and continue green till March; and sometimes this peculiar tint does not disappear before May. All the oysters are green, both spat, half-grown, and adult oysters. The oysters from this river have for a very considerable space of time been sent to Ostend, from thence to Paris, Berlin, and even as far as St. Petersburg; in fact to all the larger continental

towns. They are eaten in Paris especially as the greatest delicacies. The general opinion of the oyster proprietors residing on the Roach is, that the green ribbon weed, which grows so abundantly in that stream, is the cause of their peculiar appearance. This weed begins to grow in the latter part of the summer and lasts till March. It dies in March, and a fresh lot begins to grow. The oysters are therefore, it will be seen, green when the weed is in full development, and not while it is growing. It has been suggested that the cause of the greenness is the presence of sulphuret of iron derived from the "cement stones," which contain nodules of iron pyrites.

The oysters at Marennes in France are also highly esteemed by the French people for their greenness. The green oysters from the Roach have been analysed by Dr. Letheby, who reports that the green tint is due to a natural pigment which does not contain a trace of copper or other deleterious matter; the oysters therefore are perfectly nutritious and wholesome.

We will now pass on to the development of the spat or young oyster, and the causes favourable or unfavourable for its development. The greater portion of oysters spat about the end of June or beginning of July, the oyster at the immediate time of depositing its spawn being filled with a

whitish thick fluid, which contains the spat. While in this state the oyster is technically termed "white sick."

I now wish especially to allude to the great falling off in the numbers of the oyster that has taken place within the last few years, not only in the breeding-beds situated in comparatively shallow water on the south coast of England, but also to the beds at the mouth of the Thames. Then again we find that the deep sea beds, and all the continental oyster fisheries, were similarly affected, there being hardly any spat to be found, and the full-grown oysters died in great numbers, those living being scarcely fit for sale. At present I have not heard of any good reason having been given as to the cause of this failure, though Mr. Buckland has carefully examined many of the breeding-grounds in England and France, and has everywhere heard the same report of a bad spawning, and in some places that there has even been no spat at all.

The general results of Mr. Wiseman's observations go to show that there has been scarcely any spat at Paglesham for five years, and that the oyster proprietors thought themselves lucky to find three or four spat where previously there had been thousands placed so thick that they were obliged to be scraped off both sides of the oyster shell before being sent

to market. This was also the case in the Roach and Crouch, and in the Blackwater.

With regard to the fall of spat at the mouth of the Thames, Mr. Buckland has kindly given me the following evidence to offer concerning the spatting during various seasons :—

| | | | | |
|---|---|---|---|---|
| 1849 | ... | ... | ... | spat very good |
| 1850 | ... | ... | ... | „ good |
| 1851 | ... | ... | ... | „ bad |
| 1852 | ... | ... | ... | „ bad |
| 1853 | ... | ... | ... | „ bad |
| 1854 | ... | ... | ... | „ bad |
| 1855 | ... | ... | ... | „ bad |
| 1856 | ... | ... | ... | „ bad |
| 1857 | ... | ... | ... | „ a little spat |
| 1858 | ... | ... | ... | „ good |
| 1859 | ... | ... | ... | „ very heavy |
| 1860 | ... | ... | ... | „ very heavy |
| 1861 | ... | ... | ... | „ bad |
| 1862 | ... | ... | ... | „ bad |
| 1863 | ... | ... | ... | „ bad |
| 1864 | ... | ... | ... | „ bad |
| 1865 | ... | ... | ... | „ rather better |

Now, what is the deduction we may gather from these facts? May it be that there is a regular periodical fall of spat?

I will now endeavour to give some description of the modes of oyster culture that have proved most successful. The plan at the Isle de Ré is as follows : The chosen situation is a long mud bank exposed at low tide ; in the middle of this is a long channel

or gully containing water, and in this are placed the fascines lengthways in a continuous line ; on either side are ranges of tiles, some of them placed in wooden frames ; they are laid in rows across each other, each tile stack being lashed together so as to prevent the displacement of the tiles. The oysters are placed in small beds before and behind each stack, narrow ways being left between ; a boarded frame is also fastened above to keep all the tiles in their proper position.

In making a few observations on the enemies of the oyster, I think it will be found in all animals that multiply their species at a very great rate, every individual brings forth its thousands ; we find on the opposite side of the balance sheet there are a great number of enemies ever present to keep under the species and prevent their increasing in an undue ratio. We may divide these enemies into two classes, animate and inanimate. Among the former of course we must place those creatures which actually prey on and devour the oyster. Among the latter we include those unfavourable conditions of soil, water, atmosphere or temperature, which prevent the species from reaching its proper development. I propose now to treat of the former class. The first of these is the whelk tingle or dog whelk, *Purpura lapillus*. This mollusc is one of the greatest enemies to the

oyster. At first sight it is rather puzzling to know how a small shell like the whelk-tingle can injure the oyster. But this whelk has a very powerful boring apparatus, namely its tongue.[1]

[1] This article was never finished.

## NOTES ON THE GOLDEN-CRESTED WREN.

(*Regulus cristatus.*)

THREE species of this beautiful but minute tribe of birds have been found in Great Britain, of which one, the Dalmatian bird (*Regulus modestus*), is probably one of the rarest birds known to science, as only two authenticated specimens are known to have been captured, one in this country in 1838, and the second in Dalmatia in 1829. The Dalmatian *Regulus* differs from the other two species (*Regulus flavicapillus* and *ignicapillus*) in having no yellow on the crown of the head, a yellow streak over the eye taking the place of the black markings existing in the other kinds.

The golden- and fire-crested wrens are generally distributed over England, occurring in greater numbers in the northern parts of the island, and frequenting copses and woodlands in preference to fields or gardens. Very frequently, however, if undisturbed, they resort to the latter during the

breeding season, especially if planted with yew-trees or spruce-firs of a moderate height.

In their habits the *Reguli* are extremely active and lively, even exceeding the pari or tits in this respect, seeming to be perpetually in motion, and searching the bark, branches, and decayed trunks of trees with great assiduity in search of their food. This consists almost entirely of insects, principally of the smaller caterpillars and wood-boring larvæ, though in the autumn they feed on the flies which are attracted by the flowers of the ivy.

I have frequently seen the golden-crested wren (*R. cristatus*) seize insects on the wing in the same manner as the spotted flycatcher (*Muscicapa grisola*), pursuing the smaller lepidoptera, and the hovering flies (*Syrphidæ*) with great rapidity, and generally succeeding in capturing its prey. During the winter they are frequently much pressed for food, especially in severe frosts. At such times they approach much nearer human dwellings than is their usual custom, and become almost as familiar as the tits during these seasons. They do not appear to suffer from the inclemency of the weather, though no doubt during a protracted period of severe weather many individuals fall victims to it.

At such times they may be seen in small parties of from four or five to a dozen, traversing the bushes with great agility, hanging to the twigs in

all sorts of strange postures, and uttering almost incessantly their sharp cry, "tzit, tzit." While searching for food in this way they frequently associate with the long tailed and cole tits, seeming to be on perfectly good terms with them. They often sleep in deserted nests of the common wren, particularly when they have been built in the crevices of an old wall. In the gardens of St. Peter's College, Cambridge, there are some old decayed walls, covered with moss and ivy, which are a very favourite roosting place, and soon after sunset, during the winter months, they may be seen nearly every evening, arriving from the surrounding thickets and taking up their quarters for the night. During the early spring, they separate, and at such times the males are very combative. Two may frequently be seen during the months of March and April, sitting on some small branch, swelling out their feathers, and raising their crests with great airs of mutual defiance, giving out almost incessantly a succession of short hard notes. When fighting they endeavour to seize each other by the feathers of the throat, striking at the same time with their wings. The nest is generally built on the under side of the branch of a spruce fir and towards its extremity.

The nest closely assimilates in colour to the bark of the branch beneath which it is placed, and is

composed principally of mosses and lichens, lined with soft feathers, hair, wool, and, in one instance that has come under my notice, a quantity of silk from the cocoons of the great tiger moth (*Arctia caja*) were woven into the fabric.

A nest noticed by me in the garden of St. Peter's College, and in which the young were safely reared, was lined with the hair of the fallow-deer, of which a herd are kept in a small park belonging to the college. This nest was built in a spruce fir, and my attention was first attracted to it by the attacks made by the male goldcrest on other small birds, such as linnets or greenfinches, which might approach the tree on which he and his partner had established their domicile.

In this case the eggs were seven in number, and the young were hatched on the 28th of April. They were fed constantly by the old birds, which manifested extreme anxiety if the nest was approached.

The young became fledged very rapidly, but differed from the parents in having no yellow crest, the crown of the head being light brown, with two lateral bands of greyish-black. The first plumage is changed in the autumn, but the young birds do not assume their full colours till the ensuing spring.

## THE REPTILE VIVARIUM.

I NOW send you a few notes on reptiles which have come under my own observation, and also some hints on the management of the reptile vivarium, a subject which may possibly have attracted little attention from many of your readers on account of the widely-spread prejudice against "creeping things;" and the trouble attendant on acquiring a competent knowledge of their habits may also have deterred some otherwise fond of studying Nature under her various aspects. Frequently, a little time ago, an aquarium would be purchased by persons perfectly ignorant of its proper arrangement, and forthwith would be crowded with all kinds of fish, carnivorous larvæ, *Dytiscidæ*, and newts. In a few days, as might have been expected, a pretty scene of confusion took place. Fish were killed, or had their flesh eaten away by voracious beetles; newts escaped, and were trodden upon, or were found in unexpected places,

to the terror of weak-nerved persons; and, finally, the aquarium was voted a nuisance, and stowed away in some lumber-closet. Now, all this trouble might have been avoided if a little notice had been taken of the habits of each animal, and their natural places of abode as nearly imitated in the tank as possible. I have had my reptile vivaria usually constructed of plate glass, with a slate bottom, a zinc also being let in at the side to hold water. The sides are fitted up with rockwork, with ferns planted in convenient crevices. The bottom is covered with a stratum of peat earth, over which is placed a layer of turf and moss. As to the reptiles to be chosen as inhabitants, the tree frog, salamander, green lizard, eyed lizard, wall lizard, West Indian anolis, viviparous lizard, and blind worm are desirable inmates, usually thriving in confinement. The various kinds of frogs and salamanders must be kept separate from the lizards, as when kept together they are apt to fight; and, besides, while the saurians require to be placed in the full sunlight, the batrachians should be kept in a cool, shady place.

I have myself noticed that the tree frog will remain nestled in the damp moss during the day, waking up to full life and activity when the twilight comes on. Its first act on emerging from its shelter usually is to enter the pan of water,

remaining there for some three or four minutes. It will then fix its eye on some fly sitting on the side of the case, and will cautiously steal up to it till within a short distance, when, gathering itself together, it makes a spring, generally seizing the fly (though I have sometimes seen them miss their mark), and soon swallowing it. After having captured three or four insects in this manner, it will take up a position on some leaf, or on the sides of the glass—to which it is enabled to adhere by means of the suckers which form small flattened discs at the ends of the toes—and remain in a quiescent state for several hours, when it will be on the look-out for another meal. If very hungry, it will awake from its lethargic state during the day-time, if a fly be put in, but usually it is only on the alert at night.

The green lizard, however, is by far the most beautiful and entertaining pet, as it may be seen at one moment basking in the sunshine, with its enamelled scales flashing like emeralds; at the next, darting after flies, with lightning-like celerity. Should any smaller lizard succeed in catching a fly while it is near, the green lizard pursues the offender, endeavouring to bite, and forcing the other to relinquish the prey it has seized. It is on this account rather tyrannical in the vivarium; and though it possesses great beauty

it requires a much larger amount of food than the other lizards, to keep it in good condition, which makes its presence sometimes not desirable when space is limited. As to food, all the species will eat mealworms readily when flies are scarce, these being by far their most favourite food. The mealworms may be put in a jar with flour, and a few pieces of brown paper, where, if tied up tightly and left for some time, they will increase rapidly, so that a stock may always be kept up.

The different species of snakes must be kept in separate cases and fed with frogs, of which one or two will be consumed in a week by a large specimen of the ringed or common snake; this kind may also be tamed readily—indeed, I have now a very fine one which will, when allowed, creep into my pockets, where it will coil itself up, seeming to enjoy itself; it also evinces a great partiality for milk, a habit, I understand, frequently observed in this species.

## HYBERNATION OF FROGS.

"I WANT information about frogs. I and my brother were digging by the side of a pond during the winter—I don't recollect the month—and we turned up about two quarts of frogs. The soil was clay, and the hole they were in was nearly round, and quite smooth. They were jammed in, head and tails, as tight as possible: herrings in a barrel were nothing compared to them. They were all alive, though thin, and hopped away. I could see no means of entrance or exit, and cannot conceive how they contrived to make their hybernaculum, or how they got into it.—C. F. W."

[Perhaps the entrance of the hole in which C. F. W. found the frogs had been stopped up by him while digging, as he does not mention at what depth beneath the surface they were found. Frogs generally hybernate during the winter in any convenient hole, or drain, in the vicinity of water, where they congregate in great numbers, and pass

the colder months in a torpid state, emerging at the beginning of spring to spawn. I remember last winter seeing an immense number of frogs dug up while drainage pipes were being laid down in some fields near Croydon, through which passed a small stream. When first exposed to the air they were quite torpid, and apparently insensible, but in a short time recovered their activity. I have had several of them in my reptile vivarium ever since, and they fed freely as soon as they were removed into a warm room.]—N. L. Austen.

## SENDING TOADS TO NEW ZEALAND.

In reply to "Invicta's" question as to the best mode of sending toads to New Zealand, I think the best means he could employ would be to send them in a large tin-box, perforated with numerous holes, and half filled with moss. A stock of earth-worms and larvæ of the blow-fly (*Musca vomitoria*) should be sent on board with them, as they require to be fed every evening. The worms can be kept in moist earth, and the maggots in moss, with a sufficient supply of their natural but unsavoury food. These the toads will eat with avidity, and if a sufficient supply of worms, &c., are laid in, the greater part will most probably reach New Zealand in a healthy state. They should have fresh water poured over them frequently, indeed, every day, or they will speedily be reduced to the dry and mummy-like condition alluded to by Mr. Buckland. A good supply of toads will doubtless be a great benefit to a country so devoid

of reptile life, as countless slugs, caterpillars, and vermin of the same description, are destroyed by these useful if not elegant batrachians. I have at present some pet natterjack toads which will take flies from my fingers. It is great fun to see them fighting for worms. Two will sometimes seize each an end of a worm, and as fast as the unfortunate worm is swallowed by one, he is again extracted by the energetic efforts of the other toad, until at last he comes in two in the middle, and the two combatants retire to different sides of the vivarium to digest their hardly-earned suppers in peace. On seeing a worm or insect within reach, both natterjack and the common toad wriggle the toes of the hind-feet with excitement until they seize their prey.

THE CRESTED ANOLIS. *To face page* 131.

## THE CRESTED ANOLIS.

HAVING kept some of these beautiful little lizards for a considerable time, I am tempted to give a short description of their habits, which I hope will not prove uninteresting to your readers. The crested anolis (*Anolis cristatus*) belongs to a genus found in the West Indies and South America, and derives its name from the membranous crest that rises from the nape of the neck, and runs down the back. This appendage can be elevated or depressed at will, and when erected gives the reptile a very singular aspect, as shown in the sketch. The upper edge of the tail is also furnished with a kind of fin, strengthened at intervals by bony rays; from this circumstance, the name of *Xiphosaurus* (sword-tail) has been applied to the anolis by some authors. This crest on the back and tail only exists in the male, the female having no trace on either. She is also much smaller than her mate, seldom measuring more than four or five inches in total length, while

a full-grown male sometimes exceeds seven or eight. In colour both sexes are similar, the general hue being a rich reddish brown marbled with dark chocolate, the depth of tint varying in different specimens. This colour, however, it has the power of changing to a dull ashy grey when alarmed, the transformation being more rapidly accomplished than in the chameleon. The anolis is almost exclusively arboreal in its habits, leaping from branch to branch with the greatest agility, and rarely descending to the ground. In order to enable it to adhere to the underside of leaves, and to seek its prey in situations that could not otherwise be reached, the feet are provided with a beautiful and peculiar apparatus, that enables the creature to climb any perpendicular object, and even to ascend an upright pane of glass. To serve this purpose, the second joint of each toe is enlarged into a firm fleshy disk, covered beneath with numerous small transverse lines; this acts as a powerful sucker; and is also found, slightly varied in form, in the gecko. A semicircular pouch, or frill, of a bright red colour, marbled with yellow, can be extended from under the throat, by means of a powerful muscle round its edge; and seems to be partially a sexual distinction, as it is only found in a rudimentary form among the females. When not expanded its position is marked by a dark-coloured fold of skin,

but as soon as the creature becomes excited by the approach of a rival male, the membrane is puffed out till nearly the size of a penny-piece.

The anolis is extremely pugnacious in its habits; and during the spring and early part of the summer two adult males rarely meet without a contest. On first seeing one another, they nod their heads up and down three or four times, at the same time expanding their frills; their eyes glisten with rage, and after waving their tails from side to side for a few seconds, as if to gather energy, they dart at each other furiously, rolling over and over, and holding firmly with their teeth. The conflict generally ends in one of the combatants losing his tail, which is often devoured by the victor. The vanquished lizard obtains another tail in the space of a month or two, though it always continues shorter than the one lost, and differs from it further in the arrangement of the scales, which in the renewed tail are always arranged in semicircular whorls.

In order to provide my specimens with a dwelling adapted as nearly as possible to their natural habits, I had a vivarium made of plate glass, measuring then 2 ft. 6 in. in length by 2 ft. in height and breadth, being also fitted with a zinc cover; at the bottom of the case I placed a layer of earth and sand mixed together, and planted various flowers and creeping

plants in it, with some tree branches for the lizard to climb on. I arranged these matters some time previous to obtaining the occupants, so that the plants might have time to grow and entwine themselves round the twigs. On being first introduced into their new abode, the reptiles made themselves at home, feeding freely on caterpillars and flies. Their mode of seizing the latter insects was very curious, and deserves more particular mention. When flies were put into the case, any anolis that felt inclined to feed would crouch down and gradually steal towards a fly that happened to have settled. Having crept up to within a short distance, the anolis would seize the insect by a sudden spring, and discuss it at leisure. After having been kept in this way for some weeks, they became so tame as to take caterpillars out of my fingers, and would stalk and catch flies on the tables. For this reason they became useful inmates of a room, tending to diminish the plague of insects much more effectually than the "catch'em-alives" advertised as being so fatal to them. The mode of drinking of the anolis was principally carried on by lapping up drops of water spilt on the branches. I found this out by accident one day while watering the plants, and have since sprinkled the leaves and twigs with water several times a day for them. On this account I should imagine this genus of lizards in

their native state to be principally reliant on rains and heavy dews for their supply of moisture, as my specimens rarely descended to drink at the water saucer, always preferring to have the water poured on the branches in the way I have mentioned. During the earlier part of the summer I was obliged to divide the vivarium into several compartments, to prevent the males, of which I had four, from fighting. The females are much more peaceable in disposition, living together in the most placid manner. It used to be an interesting sight to see the whole group (for in the autumn the males lost their combative propensities) basking in the sun on some exposed branch, and expanding their brightly-coloured frills under the genial influence of the warmth. When kept in this manner they seem to do well in England, and to require but little attention in the summer, except a good supply of food and water ; but if not constantly kept in a warm room in the winter, they are liable to die, not being able to bear any degree of cold.

## HABITS OF THE TITMOUSE.

In reply to "H. D.'s" query in Land and Water as to whether instances had been known of any of the tits killing small birds, I beg to inform him that on the 27th of May last I saw a male greater tit (*Parus major*) attack a young blackcap (*Sylvia atricapilla*) and kill it by pecking it repeatedly on the head. This occurrence took place in the garden belonging to St. Peter's College, Cambridge. One that I saw kill a linnet in an aviary, commenced its feast by picking a hole in the skull, in order to reach the brain, which seems to be a favourite morsel. Bechstein states that some bird-fanciers imagine that only those specimens that have forked tails are guilty of these murderous propensities, an idea about as rational as condemning a man for wearing a swallow-tail coat. If kept in a separate cage, I think the greater tit is one of the most interesting of our small birds, from the beauty of its plumage and the liveliness of its

disposition, though the peculiar note sometimes uttered by the male, which sounds like the sharpening of a saw, does not render its presence in a room particularly pleasant. When brought up from the nest this species can be rendered extremely tame and familiar ; one in particular that I kept for some time, would come when called by his name 'Tom' and perch on my finger or shoulder. He would also hop about the table and catch flies, which made him a very useful pet during hot weather. With reference to the bearded titmouse, now generally termed the bearded reedling (*Calamophilus biarmicus*), it was separated from the true Pari, on account of the different form of the bill, which is somewhat longer and more curved at the point, while the feet are of a more lengthened and slender form, possessing less grasping power than the more exclusively arboreal species. The stomach also assumes a more muscular formation, for the digestion of the small mollusca on which it feeds in a great measure. The reed beds on the banks of the Thames are, I believe, favourite localities for this beautiful little bird, which assembles in small flocks, flitting with a short low flight just above the reeds, on the tops of which it alights, hanging with the head or back downwards, and running down the stalks with great agility in search of food. It was occasionally, I understand, also found about

Whittlesea Mere, but I am not aware whether any specimens have been observed there lately. One individual alone has been recorded from Ireland, and it is stated never to have been met with in Scotland. According to Mr. Yarrell, the young bird from the nest, in immature plumage, has the back black, with the wing and tail feathers patched with black, and the under surface entirely fawn-coloured. In the young males the "moustache" is marked by a narrow black line.

## HEDGEHOGS SUCKING COWS.

THE belief so deeply implanted in the rustic mind of hedgehogs sucking cows is as groundless as that of the blindworm being poisonous, or the toad spitting venom. As your correspondent W. H. Hill remarks, the mouth of the hedgehog is certainly unfitted for sucking the teats of a cow or any other large animal, as the sharply-pointed incisor teeth would cause immediate uneasiness. I have examined hedgehogs' tongues, and can find no trace of any apparatus for puncture and suction. Though hedgehogs cannot suck cows, common pigs often do, and are frequently great sources of annoyance to the cattle when confined in the same inclosures. As to rustic ideas of natural history, I may mention that a worthy yokel in Hertfordshire informed me, on one occasion, "That he knowed a man wot was bit in the 'and by one of the effet things, and he swelled up loike, hall hover." On inquiring into the case more

particularly, it came out that it happened in a village in Bucks, "where he wos a visitur." I caught a newt soon after, and on taking it up in the worthy man's presence, I do not think his terror could have been greater if he had handled a rattlesnake or puff-adder. In vain did I attempt to persuade him that the creature was perfectly harmless. The only opinion I could get out of him, on assuring him that he could not bite with effect was, "I knows better; and I 'spose it's hall along of them ere books as he doan't boite you."

## THE EYES OF THE MOLE.

Mr. Buckland in his interesting article on the structure of the mole, with reference to its adaptation to the animal's habits, mentions the fact of the eyes being more apparent at certain times when the mole's attention is excited. I may state that I kept a living mole for some time myself. He was a most voracious little beast, and used to eat more than half a pint of earth-worms a day. I frequently noticed that when the worms were placed in the tub, half filled with earth, in which the mole was kept, the animal would emerge, and throwing its prey on the surface, on such occasions the eyes were very perceptible, and appeared to have a considerable power of retraction, as, when the animal was not excited they were scarcely visible. On one occasion the mole managed to fall into a pan of water, which used to stand in the tub, and I noticed that the eyes were very prominently extended. Any persons who imagine that the

visual powers of the mole are very imperfect or altogether absent must be ignorant of the fact that the animal is frequently in the habit of pursuing frogs and mice on the surface of the ground, and that on these occasions it can perceive its prey at some distance; and that in the breeding seasons the males engage in desperate conflicts with each other, which generally take place out of their runs. I may also mention as a fact that the number of males is greatly in excess of the females, and that two years ago when collecting three dozen moleskins there were only eight females among the number brought to me.

## BREEDING AUSTRALIAN PAROQUETS.

A FRIEND of mine succeeded towards the end of last year in inducing a pair of Australian grass paroquets to breed, and I think your correspondent might succeed by adopting this plan. The birds were placed in a room, lighted by a skylight in the roof, and supplied with several trunks of trees with circular holes cut in them, about six inches in diameter, and a foot in depth. The paroquets were disturbed as little as possible, and plentifully supplied with food and water. After a short time the hen laid four eggs in one of the holes, laying every alternate day. All went on successfully for some time, and three young ones were hatched, the period of incubation being seventeen days. I regret to say, however, that two out of the three young birds died in a week's time, and the remaining one a few days later, from an affection in the stomach and intestines. I should imagine that the experiment might in other cases be attended with more favourable results, and to be well worth a trial. These paroquets feed their young by taking their beaks in their own, and disgorging the food, which the young then swallow.

## RABBITS AND THEIR YOUNG.

"THE teeth of rabbits prove they are not carnivorous. They destroy their young from over affection if the nest is meddled with. Many animals besides rabbits kill their offspring. Bitches and sows—the latter will eat them—when the young ones are in pain and cry: they commence by licking, and irritated by the continued cry, lick more and more severely until the skin is broken and the young animals are pulled in pieces. When any animal is wanting in milk for the sustenance of its young, it invariably kills them—the wise ordinance of nature to prevent suffering.—MAC."

In reply to "Mac's" communication on this subject, I beg to state that I believe him to be perfectly correct when he asserts that rabbits are not actually carnivorous, though I certainly think that the circumstance of their devouring their young arises from a morbid thirst in the animal, and not from "natural affection," as he seems to imagine. Moreover, though he cites the teeth of rabbits as an instance of their non-carnivorous propensities, he overlooks the fact that rats and other rodents, which feed in a great degree on flesh, resemble them in all essential points of dentition.—N. L. AUSTEN.

## CAT SUCKLING YOUNG FERRETS.

An instance came under my notice last year of a litter of young ferrets being brought up by a cat foster-mother. The old ferret died when the young ones were about seven weeks old, when they were put to a cat which was at the time suckling one kitten. She took very kindly to her new family, and reared them all in perfect health. After they were fully grown they remained on capital terms with her, though having a most thorough dislike to any other cat. The practice cats and rabbits sometimes have of killing their offspring soon after birth is, I believe, caused in most cases by the want of a sufficient supply of water, as the mother suffers from an intense thirst at such periods, and instinct compels her to have recourse to any available moisture. Nothing can be more cruel than the way rabbits, I am sorry to say, are sometimes kept, being fed on corn, bran, hay, and other dry goods, with occasionally a little green-meat; such

a course of treatment necessarily causes a natural craving for liquid, for though wild rabbits seldom drink, they generally feed at morning and evening when the dew is on the herbage. However, when tame rabbits are kept entirely on green food they are liable to disease, but this can be easily prevented by giving them corn or other dry nutriment, and taking care that a pan of water is kept constantly in the hutch or inclosure. Any one who reflects will adopt this course, by simply trying to imagine how the fluids of the body can be supported without the absorption of moisture. Even the leucoryx (*Oryx leucoryx*) and the Ariel gazelle, which inhabit vast barren plains where water is scarce, find a substitute in bulbs containing a considerable quantity of water, which grow under the surface of the ground.

## DO RODENTS REQUIRE WATER?

I BEG to state that I have kept squirrels, dormice, and rats in perfect health with a constant supply of water in their cages, and have never known an instance of death or even disease arising from it, the animals having, in many cases, lived for several years. Rats especially, I am certain, are unable to exist for more than two days without water or milk, and any one who may have taken shelter from a shower beneath a corn-rick will, probably, have observed the mice come out to drink the drops of rain hanging to the straws. Milk, I admit, in confinement, answers the purpose very well, furnishing more nutriment to the system, but no case has come under my own notice of harm occurring from the consumption of water, which in most instances is the only fluid obtained by them in a state of nature.

## NEST OF THE TEN-SPINED STICKLEBACK.

I WAS much interested by the account given in a late number of LAND AND WATER of the habits of sticklebacks during the spawning season, and as your correspondent states that he has not observed the ten-spined species (*Gasterosteus pungitius*) while forming its nest, I beg to offer him a slight account of a nest built by this industrious little fish in my aquarium in May, 1865. I procured a male and several females that evidently contained ova in the process of formation, and placed them in an oblong tank well supplied with fine shingle and aquatic plants. The male of this species is distinguished by the deep black colour of the throat and gill-covers, and on that account is sometimes called "tinker" by the country people in Hertfordshire. On the 15th of May the male began to form a nest of pieces of the leaves of *Anacharis alsinastrum*, and of the feathery fronds of the water crowfoot. The situation he chose was on an irregu-

larly-shaped pebble, which rested against the glass side of the tank, enabling me to watch his movements closely. He took great pains in his building and interlaced the various portions of the structure with great care. In about six days it was completed and the ova deposited by females, the male playing about them in the water, and performing the most coquettish antics, while endeavouring to induce them to enter the nest, and shed their spawn. The young fish made their appearance in twelve days, and were comparatively sluggish for the first part of the time, remaining either upon or in the immediate vicinity of the nest. On the fourteenth day the male set about making another nest, there being two females whose ova were not yet ripe for exclusion. This second nest was formed precisely in the same manner as the first, the male dividing his time between the labour necessary for its erection and the safety of the young brood already hatched, which gave their respected father infinite trouble, making him hunt them all over the aquarium before returning to the nest, as they generally did eventually. It is a very remarkable fact, and one not previously noticed, to my belief, that the male stickleback evinced as much anxiety for the well-being of some young minnows (*Cyprinus phoxinus*), also in the tank, as for his own immediate progeny. The second nest was completed

by the 18th of June, and the second brood hatched out successfully. I kept many of them till they reached adult fishhood, and have some of them still, including the original paterfamilias. I am not aware whether among the three-spined species either *Gasterosteus aculeatus* or *leiurus* form two or more nests, or add to the size of the first as occasion may require. The fact of the ten-spined kind carrying on their operations in this way was only made known to me by personal observation, as I was previously under the belief that all our fresh-water species performed their nidification in the same manner.

THE AYE-AYE. *To face page* 151.

## THE AYE-AYE.

(*Cheiromys madagascariensis.*)

THE aye-aye is one of those abnormal forms that can with difficulty be referred to any one class of animals, as it partakes of the distinctive characters of several, and on that account proves so puzzling to systematic zoologists. By several eminent naturalists of the present day, the aye-aye is considered the connecting link between the quadrumanous and rodent types; while by others it is thought to belong to the former tribe, being placed in their arrangement of species immediately after the gallagos. As its name implies, this creature is a native of Madagascar, where it was discovered several years ago by Sonnerat. It appeared to be unknown to the natives, as they expressed much surprise at the sight of his specimen, and seemed to have no previous knowledge of it. In size the aye-aye measures about three feet from nose to end of tail, thus about equalling a moderate-sized cat

in dimensions. The tail is covered with long coarse hair, and possesses no prehensile power; the ears are large, upright, and ovate in form, the head compressed towards the nose, the eyes being directed forwards in a peculiar manner, and not placed laterally as in rodents. In colour they are of a light brownish yellow, and extremely susceptible of light, as might be expected from the habits of the animal, which are exclusively nocturnal, more so indeed than those of the lemurs. The upper part of the body is covered with long blackish fur, white hairs being here and there scattered over the surface, which gives it a grizzled look; the chest and abdomen are grey, as are the cheeks and sides of the head. Its chief point of resemblance to the monkeys is in the form of the forehands, which possess all the grasping power found in that class; the middle finger, however, instead of being but slightly longer than the rest, is considerably lengthened; and being very thin, acts as a sort of probe, by which wood-boring larvæ can be drawn from their hiding places. This fact has been observed from watching the habits of an aye-aye in confinement. Several branches had been placed in the cage to serve as a kind of gymnastic apparatus. These branches had been tunnelled by insects, and soon after their introduction the animal, as if catching some slight sound, was

observed to turn its large and mobile ears towards them; then mounting on the boughs, it probed with its middle finger a hole evidently excavated by a grub; finding, however, that it was beyond its reach, the powerful incisive teeth came into play, and, with their help, the hiding-place of a large larva was soon laid open, the insect being devoured with great relish. The teeth resemble greatly those of a rat, or other gnawing animal, but with this difference, being very narrow towards the point in proportion to their great depth and solidity, though they possess that external layer of enamel that, like the plate of steel on an axe, always preserves them sharp and ready for use. The molars, instead of being composed of alternate ridges of bone and enamel, are covered with a smooth coating of the latter substance, their number being four in the upper and three in the lower jaw. In all the quadrumana the teats are situated on the breast, whereas in the aye-aye they are placed on the lower part of the abdomen. Thus, by this peculiarity and by the structure of its teeth, it differs widely from the lemurs, which it otherwise resembles in the formation of the brain and fore-hands. After its first discovery by Sonnerat, no specimen had reached Europe for some time, and it was thought by some authorities to have almost become extinct in its native country. Since the death of the late queen,

Europeans having had freer access to the island, several specimens have been procured. At the present time, a fine female is living in the collection of the Zoological Society, and through the kindness of the superintendent, Mr. Bartlett, I have been enabled to obtain several interesting particulars concerning its habits in confinement. When first brought to the Gardens, several varieties of insects, such as mealworms, &c., for which it was expected to show a partiality, were offered it, and were rejected by the animal; it fed freely, however, on honey, rice, or milk and eggs mixed together, and has thriven for some considerable time on this kind of diet. It sleeps during the whole of the day, never leaving its sleeping-box unless turned out. Towards dusk, the aye-aye wakes from its torpor, and traverses with some agility the branches placed in its cage, gnawing both them and the woodwork from time to time with its powerful teeth. It has never been known to utter any sound, and on that account the derivation of its native name, aye-aye, is doubtful. Some suppose the word originated from the exclamations of surprise uttered by those natives to whom Sonnerat showed his first specimen. When feeding on rice, it takes it grain by grain with the long attenuated middle finger, eating very slowly, and pausing from time to time, the tongue and lips

being moved rapidly during the process of feeding, Mr. Bartlett's opinion on the subject being that the animal feeds rather on trees secreting a saccharine sap than on insects, forming cavities in the wood with its powerful incisors, and drinking the collected liquid. Still much remains to be learnt concerning this singular being, the conduct of Dr. Sandwith's specimen as mentioned above being tolerably clear evidence that it at least occasionally feeds on insects. Sometimes the aye-aye will hang suspended by the hind claws, using the middle finger for the purpose of cleaning the fur, especially that on the tail, the finger being passed through the long hairs with great quickness, removing every extraneous substance that may happen to adhere to them. When asleep the tail is wrapped round the body, which it almost completely covers. One day last summer I remained in the Gardens till dusk, waiting for the aye-aye to show itself, as I wished to learn something more of its habits than could be observed during the day-time, when it always manifests a strong disclination to face the light. About nine o'clock, the animal protruded its head, and presently emerged from the box. After sitting on its hinder feet and scratching its ears and face with the hand-like extremities of the fore-limbs, it proceeded to discuss the contents of a saucer of

milk and eggs, which it consumed in the manner I previously described. Having eaten, it ran with considerable celerity over the branches, clinging to the wires of the cage, and exhibiting many of the motions of a lemur.

## WEIGHT OF OTTERS.

A STUFFED otter now in my possession, and which was killed on the Wye, weighed 27lb. when in the flesh, and seemed a very large specimen. An otter's skin, however, that I saw last autumn in a furrier's shop at Bergen, in Norway, must have belonged to an immense specimen, as the skin measured 4ft. 2in. in length and did not seem to have been stretched. This skin was unusually dark-coloured, and the animal was, I believe, killed in one of the tributary streams running into the Sogne Fjord.

## WASPS AND BEES.

I THINK that the wasps were certainly the primary cause of the death of the bees, though the ants may have played the part of jackals by finishing the bodies afterwards. I have myself seen wasps attack and carry off bees, always taking them at a disadvantage, as, for instance, when extracting the honey from flowers. They would seize them by the hinder part of the thorax, and kill them by plunging their stings between the segments of the abdomen. However, the law, eat and be eaten, holds good even in the case of the wasps, as the hornet, which bears the same proportion to them as the tiger does to a leopard, is their constant enemy. Five or six hornets will hover about near a wasp's nest, watching an opportunity for swooping on any straggler, which may separate himself from the swarm around the nest. When humble bees or other insects are captured by birds, they generally kill them at once, in order to avoid the chance of

being stung, and feed on their bodies afterwards. This I know to be the case with the flycatchers and the different species of wagtails, which birds, I think, most frequently feed on hymenopterous insects. Wasps are also extremely fond of all the smooth caterpillars, though they dislike the hairy ones. Blue-bottle-flies are also a favourite article of diet, perhaps even more so than bees, as they possibly possess a more "gamey" flavour.

## THE EARLESS MARMOT.

### (*Spermophilus Citillus.*)

THE genus *Spermophilus*, as defined by modern zoologists, connect the ground squirrels (*Tamias*) with the true marmots (*Arctomys*). Several species of small and active rodents are included in this genus, among which are the well-known prairie dog of America, and the earless marmot, whose habits I am about to describe, principally from a tame individual in my possession. This interesting little animal is a native of Northern and Central Europe, living in small communities, and forming burrows in dry and sandy localities, which extend for a considerable distance beneath the surface of the soil. It is tolerably prolific, producing five or six young at a litter, and commonly breeding twice a year. In form and colour it greatly resembles a diminutive wild rabbit, minus the ears, and with a small shaving-brush fastened to its hinder extremity, in place of the true leporine scut. The feet are furnished with

powerful digging claws, which it can use with great effect. While running about, my specimen constantly utters a little shrill cry, like "seek—seek—seek," rapidly repeated, which sound is common to several other members of the genus. In its wild state it feeds principally on grain roots and the bark of various Alpine shrubs, laying up a large store of provisions for its winter subsistence. The burrows of this spermophilus are usually of a considerable length, having several chambers of various sizes; the largest is commonly at the extremity of the earth, being set apart by the animal as a sleeping place, being well furnished with moss and dried grass for that purpose. About the end of autumn or commencement of winter the little creature retires to his snug retreat, and sinks into a state of lethargy like the dormice, walking occasionally for the purpose of taking food. In the spring it reappears, its condition not being perceptibly altered by the long period it has remained dormant. My specimen has become very tame through kind and careful treatment, and is a most agreeable pet, being perfectly devoid of all unpleasant smell, and extremely gentle in disposition, never attempting to bite when touched. Though its food is principally of a vegetable nature, this little animal, like most other rodents, will feed readily on raw meat, or small birds, though it does not evince the same

destructive character, so conspicuous in the hamster (*Cricetus vulgaris*), whose habits I described in a recent number. My little marmot is on most familiar terms with a large tom-cat, and the two often play together, without any display of hostility on the part of the cat. I always endeavour, by means of kind treatment, to make my animals and birds agree with one another, and have reconciled many of the most opposite classes. As I now write, a large wolf-dog is lying close to me, with the aforesaid cat snugly pillowed among his thick fur, while a magpie is hopping about close to them, and one of the dormice described in a former number of LAND AND WATER is nibbling a nut within two inches of the cat's paws. I find plentiful feeding and liberty by far the best means of making them agree, and I very seldom have any casualty among my pets. There are several species of *Spermophilus* besides the subject of the present article, and the well-known prairie dog; most of these are natives of America, the leopard marmot (*Spermophilus Hoodii*) being perhaps the prettiest of the genus. This little creature resembles the ground squirrels (*Tamias*) in a greater degree than most of the true *Spermophili*, the tail being much longer, and the animal being generally slighter and more graceful in the contour of the head and body.

## THE HAMSTER.

(*Cricetus vulgaris.*)

THE fat and comfortable-looking rodent termed the hamster is widely diffused over the northern parts of Europe, extending also into Siberia and Chinese Tartary. In length a full-grown specimen measures from twelve to sixteen inches, the legs are short, and the whole form of the animal is stout and compact. The tail barely exceeds an inch in length, and looks more like a section of a large earth-worm than anything else, as it is entirely destitute of hair. The colour of the fur on the back is greyish brown, tinged with rufous on the sides of the head. The under surface is of a deep glossy black, and three large spots of white appear on the cheeks and sides. The incisor teeth are large and powerful, and the formation of the jaw extremely massive, considering the size of the animal. The hamster is also provided with large cheek pouches, resembling those of some species of

monkeys, in which it carries food to its winter store-house. The burrow of the hamster evinces more design in its structure than those of most other animals of the same class. It is usually made in dry sloping ground, and consists of a long passage in which several large chambers are excavated at intervals, in one of which the hamster lives, while the others are used as receptacles for the winter supply of food. On account of this habit they are a great pest to the farmer in the districts they frequent, as they carry a vast amount of grain from the fields, more than a hundredweight of beans having been taken out of one of these burrows. During the colder months this animal partially hybernates, waking up occasionally to feed, and again subsiding into a state of lethargy. Each hamster forms a separate burrow, as they are of a singularly unsocial disposition, the male and female living apart for the greater portion of the year.

The hamster is a very prolific animal, having litters of six or eight several times during the year. The greatest peculiarity, however, in its nature is its utter disregard of danger, as an irritated hamster appears to possess no shadow of fear for any created being. This trait of character is developed in an equal extent in the lemming (*Myodes lemmus*). The fur is of a very soft and close texture, and is of some commercial value. I obtained a hamster last

winter, which I intended to keep as a pet, and had tolerable success, considering the nature of the beast. He was exceedingly touchy and irascible in temper, and would let no one but myself handle or take him up. When irritated, which was very often, the moment he saw any stranger looking at him, he would grunt with rage like a miniature wild boar, and throwing himself on his back, would gnash his teeth and snap viciously at anything near him. He was kept in a large cage, well supplied with hay, in which he slept for the greater part of the day, becoming active towards evening, when he was generally permitted to run loose about the room, at which time he would amuse himself by trying to burrow in the coal-scuttle, sending the coals flying in all directions by the action of his powerful digging paws, and working away in a most persevering and praiseworthy manner, in the hope of scratching a hole in the bottom, only giving up the attempt when his wind was utterly gone. On recovering himself, he would proceed to climb up the leg of my chair, in order to get into my coat pocket, where I often kept an apple for him.

Having obtained this, he would take it on the hearth rug before the fire, and there peel it in the most careful and methodical manner before eating it. On one occasion I remember he managed to get into a bedroom up stairs, and there finding a pair of

boots crept into one of them, and, I suppose, feeling his teeth wanted a little exercise, he gnawed a large hole in the toe, through which he made his exit. He was generally fed on nuts, apples, and bread and milk, with a mouse or small bird now and then by way of a treat. He was very carnivorous in his tastes, and I am sorry to say once throttled a poor little kitten about a month old, that was lying asleep unnoticed in the room when he was let out. I may here remark, that the carnivorous element is developed in the rodents to a much higher degree than is commonly supposed, the squirrels, with all the various species of rats and mice, feeding willingly on animal food. I have even known the dormouse, perhaps the most gentle and easily tamed of all, attack and kill a harvest mouse that was put into the same cage (a very large one). Rabbits and hares are, I am led to believe, free from this propensity, except in the case of females, which will occasionally devour their litters; but this unnatural practice I consider arises from the effect of excessive thirst, as I ventured to mention in a previous article. I have known an instance, moreover, in which guinea-pigs ate part of the body of one of their number which had died suddenly from disease, and this when they had abundance of food and water; and I have seen the agoutis in the Zoological Gardens seize and devour a young guinea-pig

that by accident had made its way into their inclosure.

But to return to our subject. One of the most peculiar traits in my hamster's character was his thorough fearlessness. He could not be terrified by the most violent noises, and on trying the experiment of firing a pistol (loaded with powder only) near him, he looked up in my face with a most stoical expression, as much as to say, "That's no go, old fellow!" This peculiarity of temperament I have found in all the specimens that have come under my notice. My pet hamster being kept in a warm room showed no disposition to hibernate, though he increased prodigiously in fat, which he has lost during the warm weather. On account of the shortness of his legs the hamster is by no means a rapid traveller, and it was a most amusing sight to see mine, when toddling along at his best pace, making prodigious efforts without much increase of speed, the mass of his fat shaking like a mould of jelly under the thick fur. He is now alive and well, and begs to return his most grateful thanks to the readers of LAND AND WATER for their kind attention to these "short and simple annals" in his history.

## A JUNGLE RECOLLECTION.

A FRIEND of mine, who has spent much of his life in the pursuit of sport and natural history in India, has kindly placed at my disposal the following account of an incident that came under his notice while on a hunting excursion a few years ago in the Wynàad Jungle. With my reader's permission I will narrate it as nearly as possible in his own words. "While on duty in the vicinity of the Wynàad Jungle, I received information one morning that tigers had been doing a great deal of mischief at a small native village about six miles off, several bullocks having been killed, and one unfortunate man, when returning at nightfall from the patch of cleared land where the villagers cultivated their scanty crops of 'bajjeree,' had been seized by a tiger, which sprang on him from a clump of high grass, and carried his victim off in the sight of several of his companions, who were, however, unable to render the slightest assistance to the

unfortunate man. It was this occurrence that had caused such consternation, for the natives know well that when a tiger has once taken to destroy men he will, if not speedily killed, prove a most terrible scourge to the village he frequents. Day after day one of the inhabitants is carried off, the fields are left uncultivated, the women dare not fetch water from the well for fear of the lurking beast, who, emboldened by success, grows more and more open in his attacks. It is in this strait that the arrival of a European sportsman is looked upon as a blessing from heaven, and great are the rejoicings should their dreaded foe be slain. A man-eater is generally an old worn-out animal, who, finding his powers decreasing, and having grown cunning by experience, finds it more easy to secure a human prey than to kill deer or cattle, his more usual food. He will lie in some convenient patch of jungle, near a road or frequented path, till some unfortunate man approaches; he instantly crouches and glides towards his unsuspecting victim with noiseless tread till within a few paces, when, uttering his murderous roar of attack, he bounds on the hapless wretch, and striking him down with a blow of his paw, bears off the felled and unresisting body to his lair. However, having arrived at the village, which was situated about three hundred yards from the jungle, I examined the vicinity, and found

there many tracks of tigers, besides bones and remains of animals killed by them. I was, besides, informed by the natives that there was a pool of water, situated in a small glade, about a quarter of a mile off in the jungle, resorted to by them at night for the purpose of drinking, there being no other water within several miles. I resolved therefore to remain near the pool during the night, as it was very likely that I might get a good chance of a shot there. About sunset I ascended a large 'prauss' tree (a kind of sycamore) that stood on the borders of the open space, and within fifty yards of the water, so that I would have a clear view of any animal coming there to drink. I took with me my favourite double rifle, and having made myself a comfortable perch in the fork of a large branch, I amused myself by watching the habits of the various animals and birds that showed themselves from time to time. In India, night comes on much more rapidly than in colder climates, and soon after the last rays of the sun have ceased to gild the summits of the lofty trees a deep gloom gradually shrouds the surrounding objects in obscurity. The reptile and insect tribes awake from their mid-day torpor, and keep up a chorus of buzzing and croaking that lasts till dawn. Besides these many other sounds were heard as the twilight deepened, the mournful cry of the great horned

owl, and the booming noise made by the large rock monkeys, were plainly audible. A pack of jackals, moreover, were quarrelling, in a small ravine close at hand, over the remains of a bullock killed and dragged thither by a tiger on the preceding night. I sat for some time listening, until just as the moon rose the loud roar of a tiger at no great distance made me start, and scan with great attention the dense mass of grass and 'horinda' bushes that bordered the glade. Presently the roar was repeated, now much nearer, the bushes rustled about ten paces off, and a large tigress stole cautiously from the sheltering bushes into the open ground. After glancing round her two or three times, switching her tail impatiently, she stretched out her neck and uttered a prolonged roar that reverberated through the jungle. To my surprise she was almost immediately answered by the louder and deeper voice of a male tiger, who soon after also emerged from the cover. He was truly a splendid-looking animal, and as he stood in striped beauty before me, a perfect model of strength and activity combined, I thought how powerless a man would be in the resistless grip of such a monster. As soon as he perceived the tigress he was trotting up to her with tail erect, purring loudly, exactly as a domestic cat would do under similar circumstances, when suddenly a terrific roar was heard,

and another tiger, bounding from the opposite side of the jungle, alighted face to face with his rival. Each instinctively crouched, and as they gradually crept nearer to one another, lashing their sides with their tails and uttering loud menacing growls, their eyes glared like burning coals. Suddenly the larger of the two (the first comer), after moving his hind-legs restlessly for a second or two, dashed at his opponent with lightning-like rapidity, making the jungle resound with the thunder of his voice. His wary antagonist was on the alert, and, springing lightly on one side, avoided the first crushing stroke of the paw. Then closing with each other, they bit and tore with teeth and claws, now rearing to their full height, now rolling over and over on the ground, their fierce roars, answered by the screaming and chattering of numerous monkeys and peafowl, roused from their sleep by the tumult, their forms now plainly seen, and now dimly visible through the dust raised by their furious struggles, as they lay locked together in the death grapple. By this time, however, the larger of the combatants had obtained a decided advantage, his teeth being buried in the throat of his rival, whose struggles grew momentarily fainter under the choking gripe, his defiant roar changed to a low bubbling moan, his tongue protruded from his jaws, and after kicking convulsively for a few

seconds his form, lately so instinct with life, lay motionless. The victor, after smelling the prostrate carcase as if to make certain that life had departed, turned away, and advanced towards the tigress, who had remained stretched at full length on the ground, watching with half shut eyes the conflict between the males. As he approached I could see that blood trickled from several gashes on his neck and fore quarters, though he appeared to have suffered no material injury. Now, I thought, was the best time for a shot, so taking a steady aim behind the shoulder, I pulled the trigger. The report of the rifle was answered by a loud roar of mingled rage and pain, and the wounded tiger springing furiously forwards alighted close by the root of the tree on which I was seated. I may here remark that a tiger, generally speaking, when fired at from a tree seems to have no idea of looking for his enemy among the branches, but in nine cases out of ten bounds blindly forward if wounded. This makes tiger-shooting on foot so hazardous a pursuit, for when the hunter is plainly seen by the infuriated animal his life is in most imminent danger, for few wounds prove immediately fatal to a tiger, and prevent his making a charge. In my case, however, the tiger, when he alighted on the ground, by chance caught sight of me, and sprung at the tree with a savage roar; my shot had struck

him in the shoulder, producing a severe but not a mortal wound. Such a perfect incarnation of ferocity and baffled rage as he now presented I never before beheld. His eyes gleamed with a malignant green light, his whiskered lips were drawn up revealing the long white tusks, and lending to his enormous head an indescribably savage expression. Finding his efforts to reach me vain he crouched for a few moments; then roused to madness by the pain of his wounds, he rushed on with redoubled fierceness, bit the trunk of the tree, and furrowed it with his claws. At last I succeeded in planting a ball in the mortal spot behind his shoulder; uttering an expiring roar, he rolled over biting and tearing at everything within his reach. In a moment or two his struggles grew fainter, he stretched out his muscular limbs to their full extent, a convulsive tremor passed over his huge frame, blood gushed from his mouth, and the monster lay motionless in death. I at first intended to examine my noble quarry, but remembering that the tigress had vanished in the jungle but a short time previously, and hearing another tiger roaring in the distance, I thought it more prudent to remain where I was during the night; so rolling myself up in my blanket I slept soundly till dawn, when I descended and had a good look at the bodies. The smaller tiger had his throat torn completely open, and

several deep claw wounds on sides and belly, from which the intestines protruded, would alone have proved fatal. His rival, though severely scratched, had received no hurt of any consequence, and would, I have no doubt, have recovered perfectly in a short time. The following were the dimensions of the animals.

| | ft. | in. |
|---|---|---|
| Total length ... ... ... | 10 | 6 |
| Length of tail ... ... ... | 3 | 0 |
| Height at shoulder ... ... | 3 | 4 |
| Girth of body ... ... ... | 5 | 6 |
| Girth of forearm ... ... ... | 2 | 7 |
| Girth of neck ... ... ... | 3 | 1 |
| Girth of head ... ... ... | 3 | 7 |
| | | |
| Total length ... ... ... | 9 | 7 |
| Length of tail ... ... ... | 2 | 10 |
| Height at shoulder ... ... | 3 | 0 |
| Girth of body ... ... ... | 5 | 3 |
| Girth of forearm ... ... ... | 2 | 5 |
| Girth of neck ... ... ... | 3 | 0 |
| Girth of head ... ... ... | 3 | 4 |

Many of my readers will no doubt think these rather small specimens, being accustomed to hear of tigers of twelve and even fourteen feet long, but nearly all these great measurements have been taken from skins which have been stretched beyond their proper length in the process of drying. I am certain also that if tigers and other large game were measured immediately after being killed their

size would be very materially lessened. Of course tigers are large sometimes, but one very seldom meets with an animal exceeding eleven feet in length, the common size being from nine to nine and a half feet. Soon after the sun rose a large crowd of natives from the village came to see what success I had had, and great was their delight at seeing two of their dreaded foes past doing mischief. A couple of "hacheries" (native carts) were brought from the village, and in these the defunct tigers were dragged back in triumph, the natives dancing round the carts and singing extempore songs in derision of the tigers. The chorus taken up by the whole crowd was something deafening, and I was glad when having reached the village the important ceremony of singeing the tiger's whiskers was gone through. The performance of this rite arises from the superstitions of the natives, who imagine that if the custom be not complied with they will be haunted by the tiger's ghost. In the present case the oldest "Shikaree" (hunter) present abused the tiger's ancestors up to the fifth generation, singing away most assiduously the whole time, and finished by spitting on his face and right jaw in token of contempt. The claws are held in great veneration, for it is believed that a charm composed of two of them will render the possessor invulnerable against similar weapons.

THE RATEL.

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## PORTRAIT OF THE RATEL.

The reader will be pleased to know that Mr. Austen's knowledge of natural history, and talent as an artist, were of use to the *savants* engaged in the elucidation of the history of the ancient people who lived in caves, of whose habits and mode of life we know so little.

By the kindness of Professor Rupert Jones, F.R.S., F.G.S., &c., Editor of *Reliquiæ Aquitanicæ*, I am enabled to reproduce an extract from Part XV. of that work, published September, 1874. This was illustrated by Mr. Austen. I am indebted to Professor Jones for the loan of the wood block.

"On an engraved figure of a glutton, from one of the Dordogne caves, by Professor Rupert Jones, F.R.S., &c., Fig. 80, is an outline of the glutton, cut on a piece of antler from one of the caves in the Department of the Dordogne, and is engraved from the photograph of a specimen believed by the

late M. E. Lartel to have been extracted by a workman from one of Mr. H. Christy's diggings in the caves of Dordogne.

"In M. G. de Mortillet's *Promenades Préhistoriques à l'Exposition Universelle*, 1867 (*Matériaux pour l'Histoire de l'Homme*, vol. iii., p. 201), this specimen, referred to as being exhibited among others from the caves of the Department of the Dordogne, and belonging to M. Peccadeau de l'Isle, is described in these words:—'La pièce capitale est une lame de bois du renne, trouée pour suspension, portant une gravure très-nette d'un animal qui a un peu le museau carré des hippotames, mais qu'il est fort difficile de determiner exactement."

"The object itself is a blade-like piece of reindeer antler, perforated near one end, and bearing an incised outline of a hairy quadruped, with heavy head and large tail.

"To this figure the glutton, *Gulo luscus* (Linn.), most nearly answers, as indeed the late M. Lartel always thought. The hairy saddle on the back of the figure very nearly coincides with the outline of the 'blackish dorsal disk' (Dr. J. E. Gray, 'On the Mustelidæ' *Proceedings, Zoolog. Soc.*, 1865, p. 120), well seen in Schreber's figure of the glutton (*Säugthiere in Abbildungen nach der Natur mit Beschreibungen*, iii., 1779, pl. 2); and distinguishable in the more lively picture of the glutton in

Paul Gervais's *Histoire Naturelle des Mammifères*, 1855, p. 109. The tail and jaws in the outline from the Dordogne are larger than represented by either Schreber or Pallas, who seem to have had their drawings made from dry stuffed specimens. Gervais is more true to nature in giving a fuller tail, and a rather thicker, though short, muzzle; but the last is not so large as that in our engraving (Fig. 80), which may be an exaggerated feature, and due to the imperfect art, or obstinate whim, of the aboriginal draughtsman.

"The exact proportions, however, of the North European glutton are best shown in the accompanying woodcut, being a portrait of the glutton now living in the Zoological Society's Gardens, London, carefully studied and drawn by Mr. N. Laurence Austen, F.L.S., F.Z.S., who is well acquainted with the glutton in its Norwegian home."

Mrs. Austen has given me the following, the last paper her son ever wrote:—

*Later Notes on the Scandinavian Reindeer; being a Contribution to "Reliquiæ Aquitanicæ,"* by N. Laurence Austen, Esq., F.L.S., F.Z.S., &c., and reprinted by permission of the Editor, Prof. Rupert Jones, F.R.S., F.G.S., &c., of the Royal Military and Staff Colleges, Sandhurst.

Wild Reindeer were formerly, it is believed, found throughout the greater portion of the Scandinavian peninsula; but at the present day they are confined to the more northern parts. They exist in large herds on the more elevated mountain plateaux of Norway—but do not appear to descend lower than the Birch-limit, about 3,700 feet above the sea-level, and seem never to frequent the dense pine-forests which clothe the lower slopes of the mountains.

The principal food of the Reindeer during the summer months consists of grass, and the foliage of the dwarf willows (*Salix glauca* and *S. hastata*). They also feed on various species of cerastium, on the buckbean (*Menyanthes trifoliata*), and they are especially fond of the glacier buttercup (*Ranunculus glacialis*), which is found only above the Birch-limit, and extends considerably above the line of perpetual snow, growing in clefts of slaty rock. This plant is called "Ren-blumme" or Reindeer-flower, in Norsk; two varieties are known, one having white, the other purplish blossoms.

During the winter the Deer subsist almost entirely on the Reindeer-moss (*Cladonia rangiferina*), which grows on the higher parts of the "fjeld;" where the snow does not lie so deeply, constant gusts of wind sweeping over it, and causing it to collect in ravines and sheltered corries.

At the commencement of spring the Reindeer

descend from the snowy regions to the sub-Alpine pastures, for the purpose of feeding on the sweet young grass then springing up; but as soon as the weather becomes warm, they return to the highest fjelds to escape the plague of insects, as they are especially annoyed at this season by a species of breeze-fly (*Æstrus tarandi*), which lays its eggs, covered with an adhesive secretion, on the hairs of the Deer's back. The larvæ, when hatched, burrow their way beneath the skin, and, as in the case of the *Æstrus bovis*, which attacks cattle, form a considerable swelling.

During the heat of summer, the herds resort to the largest "snee-fonds," or snow-fields, remaining on the snow during the day and descending morning and evening to feed. At this season the old stags separate from the main herd, not rejoining it until their horns are fully developed, which takes place about the beginning of September, when the animals are in their best condition.

The period of gestation with the hind is about eight months; the fawns are generally produced in May or the beginning of June. In August the fawns have horns from 4 to 9 inches in length, according to sex; and in November, when they lose the velvet, the antlers measure from 12 to 15 inches. Unlike the generality of the Deer tribe, the young are not spotted or dappled when first born, but are

of a uniform reddish-brown tint. In August this changes to a blackish colour, becoming grey during the winter.

Although both sexes are furnished with horns, those of the hind (or "simle," as she is called in Norsk,) rarely exceed 14 to 18 inches, measured along the curve; while those of the stag or "ren" reach a much larger size. A pair taken from a Deer shot by myself two years ago measure as follows:—

| | Inches. |
|---|---|
| Length of antler following the curve . . | 47 |
| Width between antlers from tip to tip . | 41 |
| Length of brow antlers . . . . . | 14-15 |

The total number of points, including the small ones on the brow-antlers, is thirty-seven; but the head is a remarkable one, and by far the finest I have ever shot. I have described the circumstances under which this head was obtained in LAND AND WATER, Feb. 4, 1871.

In the great majority of Reindeer horns from Northern Europe only one brow-antler is fully developed—the other appearing merely in a rudimentary form, as a knob, or in some cases a spike, 3 or 4 inches in length. I have noticed that this is also the case with the North-American "Cariboo," though I have seen heads of this animal from Newfoundland in which both frontal antlers are perfectly developed.

Professor Rupert Jones adds the following :—

"We deeply regret the recent death of the talented young naturalist Mr. N. Laurence Austen, F.L.S., &c., who favoured us with this note on the Reindeer, and with the sketch of the Glutton.

"He died, on August 9, from concussion of the brain, caused by a fall from his horse; and his sorrowing friends see the promise of a useful life of observation and research sadly cut off by his sudden death.

EDITOR, *Reliq. Aquit.*"

Mrs. Austen writes: "My dear son often said that Mr. Keble's lines were a perfect picture of Norwegian mountains and their influences":—

Where is Thy sacred haunt, eternal Voice,
The region of Thy choice,
Where, undisturbed by sin or earth, the soul
Owns Thy entire control?
'Tis on the mountain summit, dark and high,
When storms are hurrying by:
'Tis mid the strong foundations of the earth,
Where torrents have their birth.

No sounds of earthly toil ascending there
Mar the full burst of prayer;
Lone Nature feels that she may freely breathe,
While round us and beneath

Are heard her sacred tones: the fitful sweep
Of winds across the steep,
Through withered bents—romantic note and clear,
Meet for a hermit's ear,—

The wheeling kite's wild solitary cry,—
And, scarcely heard so high,
The dashing waters, when the air is still,
From many a torrent rill
That winds unseen beneath the shaggy fell,
Track'd by the blue mist well:
Such sounds as make deep silence in the heart,
For thought to do her part.

KEBLE.

## ARSLAN, THE TURKISH WOLF-DOG.

In May, 1873, I received from my friend Sir Edmund Hornby, at that time judge of H.B.M. Consular Court at Constantinople, a splendid dog. Sir Edmund wrote :—

"I have obtained a dog for you. He is a splendid animal of the Koordish breed, and was procured from the district of Erzenhiern from the shepherds. He is ten months old. His father guards a flock of two hundred sheep against any wolves, and has killed several. His name is 'Arslan,' which means in Turkish 'the Lion.'

"He is very fierce to other dogs, and, young as he is, has already killed several. He is difficult to tie up, on account of the size of his neck, and would be much more mild if left untied; but then I would not give much for the life of any one who bullied him, or who came uninvited or unintroduced into your room, or who attempted to garotte his master.

"He is accustomed to cold, and prefers it to heat, as his coat shows. His ears are cut in order not to get them lacerated when fighting wolves, hyenas, the panther or black leopard," &c.

My experience with this dog can be found in my *Curiosities of Natural History:* Bentley, 1873.

Arslan killed so many dogs that I was obliged to intrust him to the care of my friend Austen, who wrote the following description of him.—F. B. :—

"He is a rich reddish tawny colour on the greater part of the body, deepening into black on the neck and muzzle; there is a white patch on the chest and the long hair of the tail is of a lighter hue than the prevailing tint of the body. The fur consists of a soft woolly undercoat (sufficiently thick and dense in texture to preserve the animal from the ill effects arising from the damp and cold), and of a quantity of longer hairs which are capable of being erected at will, and attain their greatest length on the neck and flanks. The dentition is more powerful than that of most domestic dogs, and the bony occipital crest is very strongly developed for the attachment of the powerful muscles that move the jaws. The limbs are peculiarly muscular, and the whole form indicative of immense strength combined with perfect symmetry and grace.

His dimensions are as follows :—

| | ft. | in. |
|---|---|---|
| Total length . . . | 7 | 5 |
| Height at shoulder . . | 2 | 8 |
| Height to top of head . | 3 | 2 |
| Girth of chest . . . | 3 | 8 |
| Girth of neck . . . | 2 | 3 |

His ears have been cropped, but Mr. J. K. Lord, who has had considerable experience of this breed of dogs on the mountains near Scutari, kindly informs me that the ears, when entire, are slightly pendulous, much resembling those of the Pyrenean wolf-dogs. I have always found "Arslan," with the exception of his hatred to strange dogs, to be most affectionate and faithful in disposition, though when he is once really excited, you would find you had "woke snakes" in earnest. Since he has been with me he has constantly been at perfect liberty in a large garden, and I have found that his temper has materially improved. I have not experienced the slightest difficulty in reconciling him to my other dogs, and to several belonging to my friends. As I am writing this, I can see him on the lawn with a litter of bull terrier pups about three months old, and associating with them in the most friendly manner, not even considering his dignity affronted by an occasional tug at his tail.

With strange dogs, especially large ones, he is

unsafe in the extreme. On one occasion he attacked a fine Newfoundland dog in the road, nearly opposite to our house, and would speedily have killed him if I had not been present, neither the owner of the dog nor the spectators, who rapidly collected to see the row, daring to interfere. I may here mention a safe and humane way of inducing a dog to relinquish his gripe of anything he has seized: Press the nostrils of the dog with the left hand, and, placing the forefinger and thumb of the right behind the upper canine teeth, raise the upper jaw, and the dog will be immediately compelled to let go from his inability to breathe. I find that Arslan's bite differs from that of other dogs in the following way: When he has seized another animal, instead of maintaining his hold, he will tear his teeth violently out of the flesh and muscles without unclosing them, thereby producing a most severe wound. This is also the case with the wolf. He is a capital house dog, and though he will permit most people to pass him in the day-time without molestation, he has a rooted aversion to beggars, and tramps, of every description; and at night it would be dangerous in the extreme for any stranger to venture on the premises.

I remember on one occasion he floored an organ-grinder who presumed to shake a stick at him

sending him and his instrument flying in different directions, besides knocking his wind completely out of him. The poor creature was perfectly green with terror, and none of his fraternity have been seen near the place since. Arslan's bark is peculiarly loud and deep-toned, and on a still night I have heard it from a great distance. When fighting, however, or irritated, he never utters the slightest sound and never gives warning by his voice of any attack he may meditate. I believe this breed to be the existing type of the Molossian dogs of ancient Greece, mentioned so much by classical authors with reference to their undaunted courage and great strength.

Three of these dogs were considered to be a match for a lion and two for a bear. They are probably the most ancient breed in existence, and as, when reared in company with other dogs, they become free from savage propensities, they are well worthy of introduction to this country, as their magnificent proportions and great fidelity make them valuable. Arslan unfortunately in former days had been trained to kill all other dogs, jackals, &c. that might come in his way, in order to render him a more efficient guardian to the flock in his charge; but he still can be easily reconciled to any individual dog, and will always remain on most

friendly terms with it. Arslan was awarded a silver medal at Asburnham Hall dog-show 1863."—N. L. AUSTEN.

Austen made several capital portraits of his dear Arslan. The best of these is now hanging up in the drawing-room at The Acacias, Croydon.—FRANK BUCKLAND.

THE END.

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